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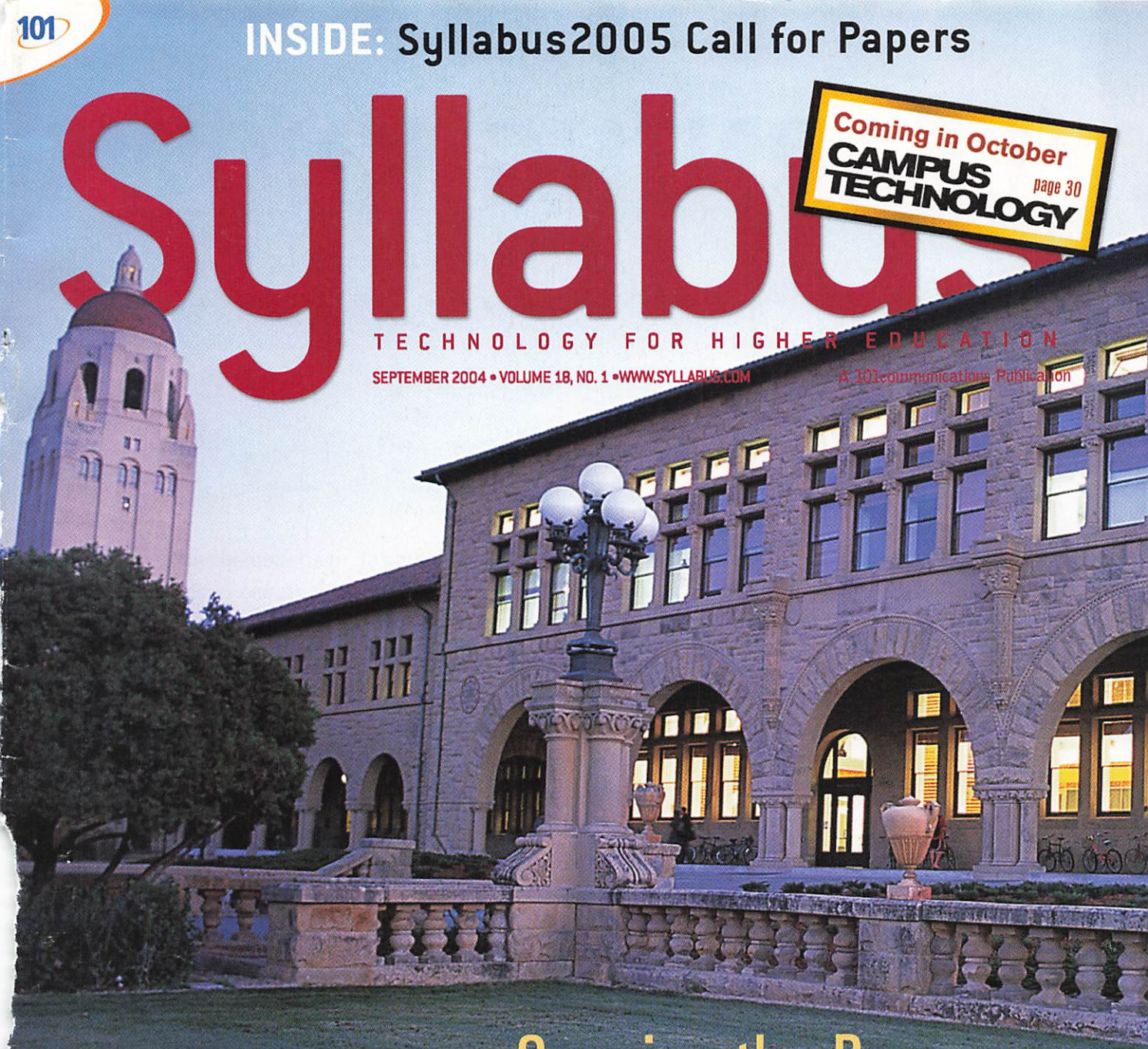

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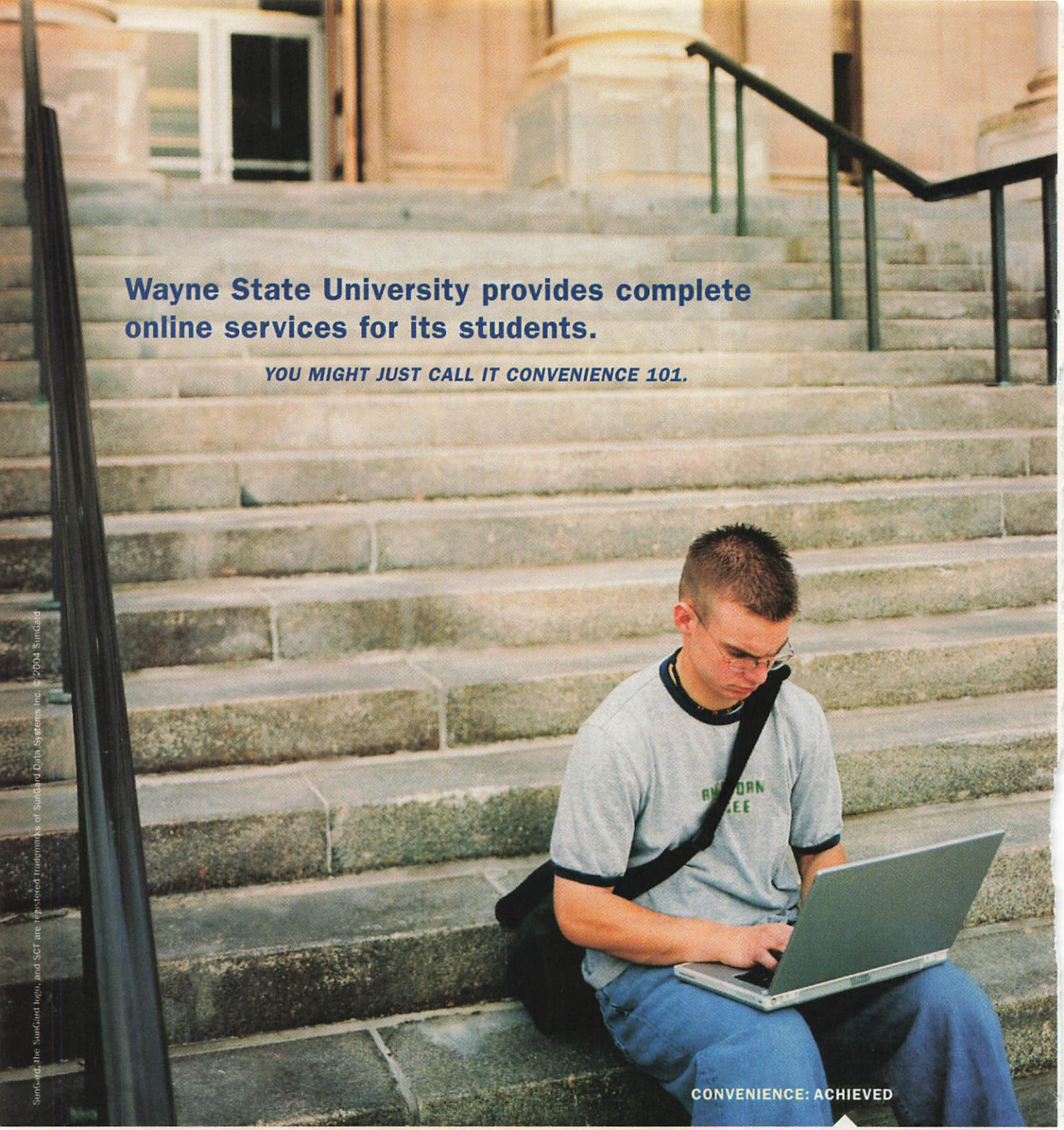
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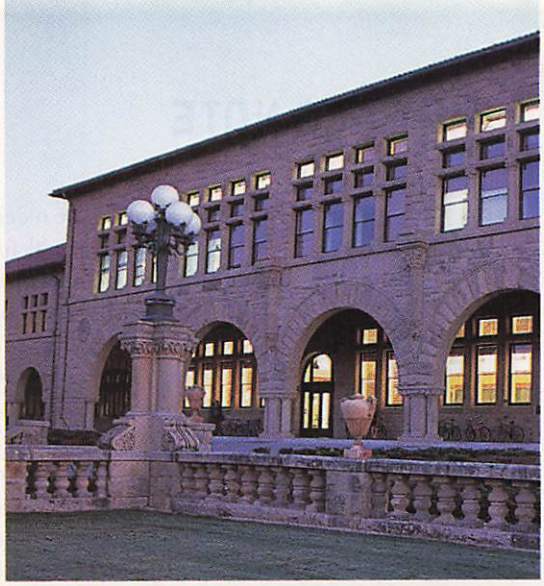

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SYLLABUS EVENTS Syllabus2005 July 24-28 Call for Papers (Pages 52-53)

EDITOR'S NOTE

Mary Grush, Editor

In one of the oldest buildings on the Stanford University campus, you'll find the newest classroom technology. Through a grant from the Wallenberg family of Sweden, the century-old stone structure was recently remodeled and transformed into a showplace for learning technologies. But the point wasn't to offer the best, most expensive technology to a few of the brightest students. Wallenberg is a living laboratory for research in education and home to the Stanford Center for Innovations in Learning (SCIL). Our cover story, "Wallenberg Hall: Opening the Door to New Technologies" (page 12) explains how the seamlessly integrated technology of Wallenberg offers a cutting-edge teaching and learning experience to faculty and students while giving researchers a chance to push the envelope in education. The work at Wallenberg will help shape the best, most practical uses of technology in education. This is truly the story of an effort that will ultimately support the progress of education technology for everyone.

Syllabus has been following the progress of technology in higher education for sixteen years, from the early adopters of multimedia courseware, through the expansion of the Internet and Web-supported instructional programs, to today's highly integrated campus information systems. Our coverage over the years has reflected the evolution of technology on campus—from isolated pockets of innovation in the classroom by individual faculty, to the mission-critical operations that have unified academic and administrative departments and extended the campus far beyond its physical walls. Technology is transforming the way business gets done at your institution, and our coverage of your story is changing, too. In the center of this issue (pages 30-31) you'll find the announcement of our new, redesigned magazine—so new that we are changing its name. Beginning October 1, 2004, you will receive *Campus Technology* magazine.

September not only marks the last issue of the magazine under the name *Syllabus*, it is also my own 13th anniversary with the publication. If there is anything I have learned in thirteen years of covering technology in higher education, it is that higher education has an informed leadership that makes its technology decisions in light of their institutions' central missions of teaching, learning, and research. The pages of the new publication will reflect those priorities as well, by expanding to cover more of the administrative technologies while retaining a holistic view of technology for higher education.

Save the dates for Syllabus2005—July 24-28, 2005! Our annual summer conference will be held in Los Angeles, with one day of programming on the UCLA campus. Consider the Call for Papers on pages 52-53 of this issue. Then watch for conference updates at www.syllabus.com.

Enjoy this issue of *Syllabus*–See you next month in *Campus Technology*!

Mary Grush

Letters to the editor should be addressed to the editor and sent to 101 First Street, #605, Los Altos, CA 94022, or via electronic mail (mgrush@syllabus.com). We reserve the right to edit all submissions. **News and product information** will be considered for publication. Please send all materials to Claudia Linh. If you are interested in writing for *Syllabus*, please send a brief description of your article idea along with writing samples to the editor at the above address.

Syllabus
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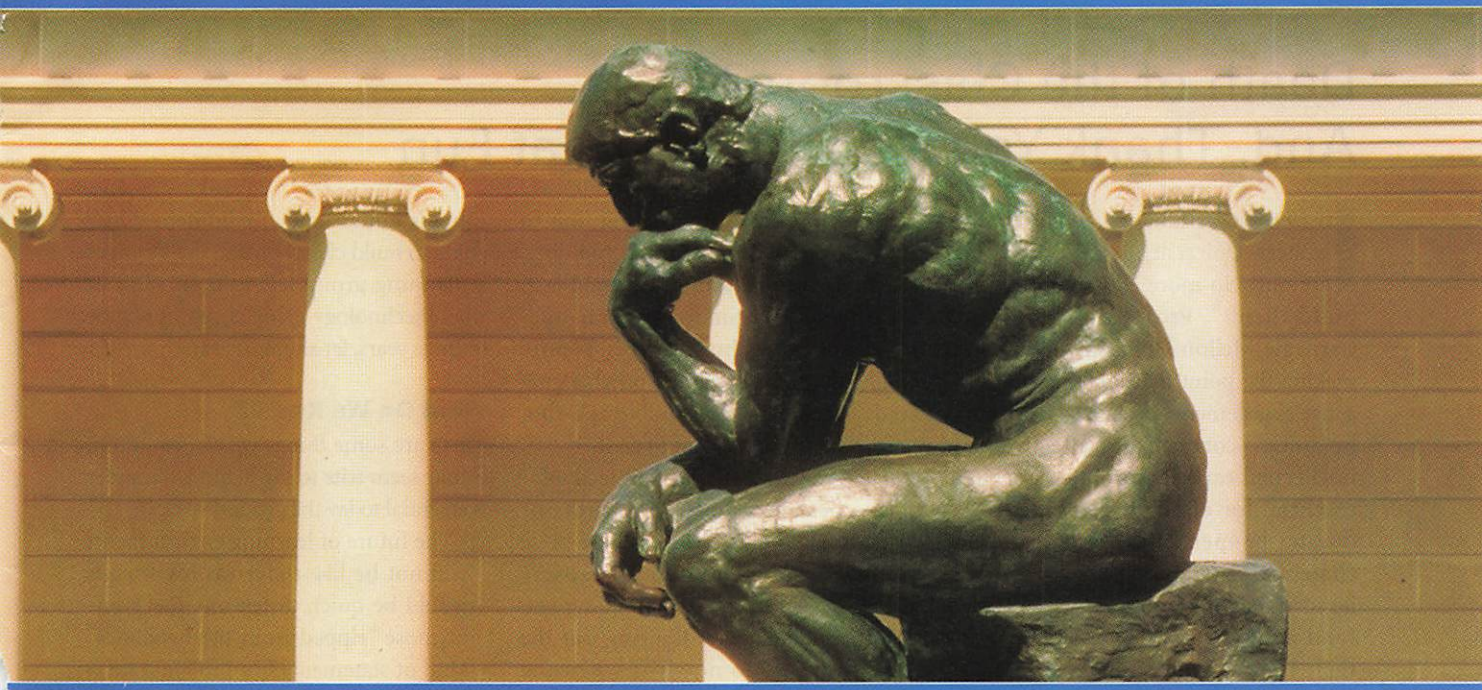

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Phillip D. Long

TRENDS

AN INFORMATION RESOURCE OF INTEREST TO EDUCATORS

Death of the Classroom? And, Thank You – It's Been Great Fun

In 1999 Roger Schank, then at Northwestern University, said,"Classrooms are out! No more classrooms! Don't build them!" Prof. Schank, now at Carnegie Mellon University West, was making the point that learning through active engagement and failure—learning by doing—connects our affective and intellectual experiences in a way that's essential for effective learning. This doesn't happen often enough in the contemporary classroom. At that time he advocated the "rule of 1/3"—children (and adults) should spend a third of their time talking with each other in face-to face-interaction, a third of their time doing something (building things), and a third of their time engaged in computer-based instruction.

Traditional classrooms don't necessarily prohibit building things or doing technology-supported inquiry, but they have not exactly facilitated the flexible transition from one learning mode to another. Some 10 years ago, the Great One (that's Wayne Gretsky, for all you non-sports fans) attributed his skill on the ice by saying, "I skate to where the puck is going to be, not where it has been." So where are the classrooms going, and are we building them to what we currently "know," based on our past and current experiences, or for tomorrow?

The Time Scale Problem

Learning spaces are capital projects. The calendar of any capital project is years; life cycles of 40 to 80 years are expected. On the one hand, that makes sense. When you're investing $15 million to upwards of $300 million in a building, you figure the investment should last. Going back to the funders two years after a new space was built to spend more money upgrading it based on changing needs is generally as desirable as a root canal. You just don't want to do it.

The time scale of learning technologies is best measured in months or years, single digits, please. Where these investments are central to the delivery of instruction in the new building you face three challenges: figuring out the right thing to do now (or when the building eventually opens); identifying how you're going to pay for the maintenance and upgrade of the technology you know will be mid- or even late-life by the time the building is in use; and, last but not least, building a space that provides the kind of technology-enabled learning experiences that you anticipate in 2035. After all, the building is still in early- or mid-life at that time.

Of course, building facilities staff and architects know the difficulty of finding any school building over five years old where space is utilized as originally intended. For buildings over forty years old, the original intent is almost certainly lost. Educational needs are, unfortunately, articulated in terms of the experiences faculty have had. Even the architects and planners tend to optimize for the *current* practices and needs of the client. Some commission study groups do visioning activities. These are often fun and liberating, but largely fail to influence much, because their predictive value is understandably limited. Who's going to build classrooms to the vision of a planning group laying their view of where technology-enabled spaces will be in three years, let alone 20 years?

What Do We Know?

There are some things we can count on. It may seem trite to say it, but a reminder is essential to lay the groundwork:

- The future of learning environments will not be like today (as my friends would be quick to tell me, that's one of those "ripped from the headlines" kind of statements from the *Journal of Duh...*).
- We will be just as under-resourced tomorrow as we are today.
- Technological change will either continue at current rates or increase.

What should those of us interested in using technology for teaching effectively do? How can we advocate for ephemeral technologies whose value decreases by the minute, but whose costs are planned annually at best?

Returning the Focus to the Interaction

Technology-enabled spaces can provide value across 24 hours of the day, but what students and faculty want to do in them differs from morning to afternoon to evening, and late into the night. Do the spaces adapt to these usage patterns? Typically, we build a mixture of spaces and students migrate to them based on their needs, leaving some always underutilized. In an age where real estate is often a

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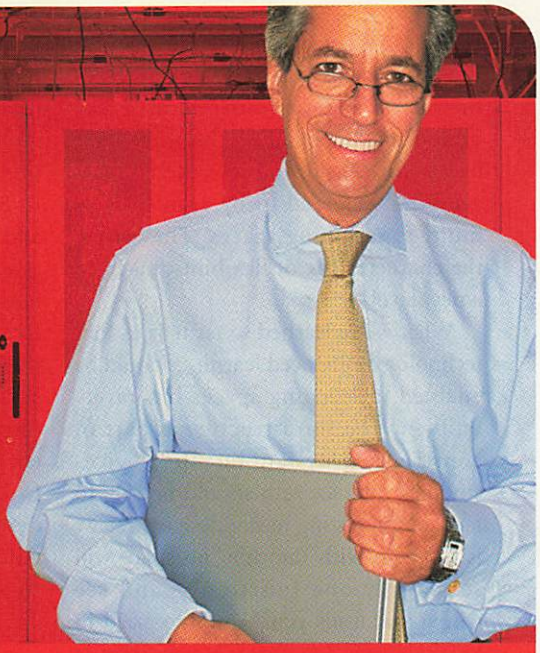

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limiting variable, enabling spaces to themselves adapt to different uses may be more effective. As the time scale becomes weeks or months, these spaces are often referred to by architects as multi-functioning spaces. They share the characteristic of flexibility, taken to a new level.

What we've learned so far tells us that technology-enhanced learning should be enabled in learning spaces but rarely built-in. The infrastructure is part of construction design, but the devices students interact with should not be. In fact, an interesting future design strategy is to begin with the rule "no space will serve only one function"—and see where that leads you. You may need to break the rule, but it should be for cause, not by default.

Faculty need to switch among learning modes within the same instructional period. That means switching from lecture, to team interaction, to individual reflection and study, to hands-on building or experiment, and back again, *in the same or adjacent spaces.* Everything we've learned about how we learn points to this pedagogical flexibility as critical to effective learning. From the faculty perspective, this is no easy recipe. In fact, the impediment to building technology-enabled spaces that you might mistake for comfortable lounges or labs, depending on the time of day, is the cultural history of the professoriate. Now that's another challenge.

Thank You

As you know by now, *Syllabus* is revamping its style and extending its portfolio to try to be more inclusive of the entire university and its technology needs. A new look will be unveiled next month. However, one of the changes is in format, and a consequence of that is the departure of the regular column, and thus the regular columnists.

It's often hard to tell when you're sitting in your study writing words that will not appear for another two to three months if you're really providing anything of value. I've received e-mails, but more often it's in a comment here, or a P.S. at the end of message there, suggesting that there are some readers beyond my immediate family.

So while the grind of writing a monthly column, and the relief at not having that pressure in the future, are things I'm looking forward to, it has been also a pleasure and privilege to share things I care about with you. The discipline has been valuable. The unceasing creativity of my colleagues trying to make education technologies achieve their promise has provided inspiration and comradeship. Communicating your work with a voice has been a challenge. I've learned a lot. Thanks. Consectatio veritas apud amici <exit column 48>

Phil Long, Ph.D. *(longpd@mit.edu) is senior strategist for the Academic Computing Enterprise at MIT. He is also a senior associate for the TLT Group of the AAHE.*

Notable Technology Prognostications

"I watched his face (Samuel F.B. Morse) closely to see if he was not deranged, and was assured by other Senators as we left the room that they had no confidence in it either."

—Senator Oliver Smith of Indiana, 1842, after witnessing a first demonstration of the telegraph

"Well-informed people know it is impossible to transmit their voices over wires, and even if it were possible, the thing would not have practical value."

—Editorial in the *Boston Post*, 1865

"There's a lunatic in the lobby who says he's invented a device for transmitting pictures over the air. Be careful, he may have a razor on him."

—Editor of the *London Daily Express*, commenting to a staffer on someone who had asked to see a reporter and was waiting downstairs, exact date unknown.

"Computers in the future may weigh no more than one and a half tons."

***—Popular Mechanics*, Forecasting the Relentless March of Science, 1949**

"I think there is a world market for maybe five computers."

—Thomas Watson, Chairman of IBM, 1943

"I have traveled the length and breadth of this country and talked with the best people, and I can assure you that data processing is a fad that won't last out the year."

—The Editor in Charge of Business Books for Prentice-Hall, 1957

"But what . . . is it good for?"

—Engineer at the Advanced Computing Systems Divisions of IBM, commenting on the microchip, 1968

"There is no reason anyone would want a computer in their home."

—Ken Olson, President, Chairman, and Founder of Digital Equipment Corporation, 1977

See references - Cerf, C. and Navasky, V. (1984).

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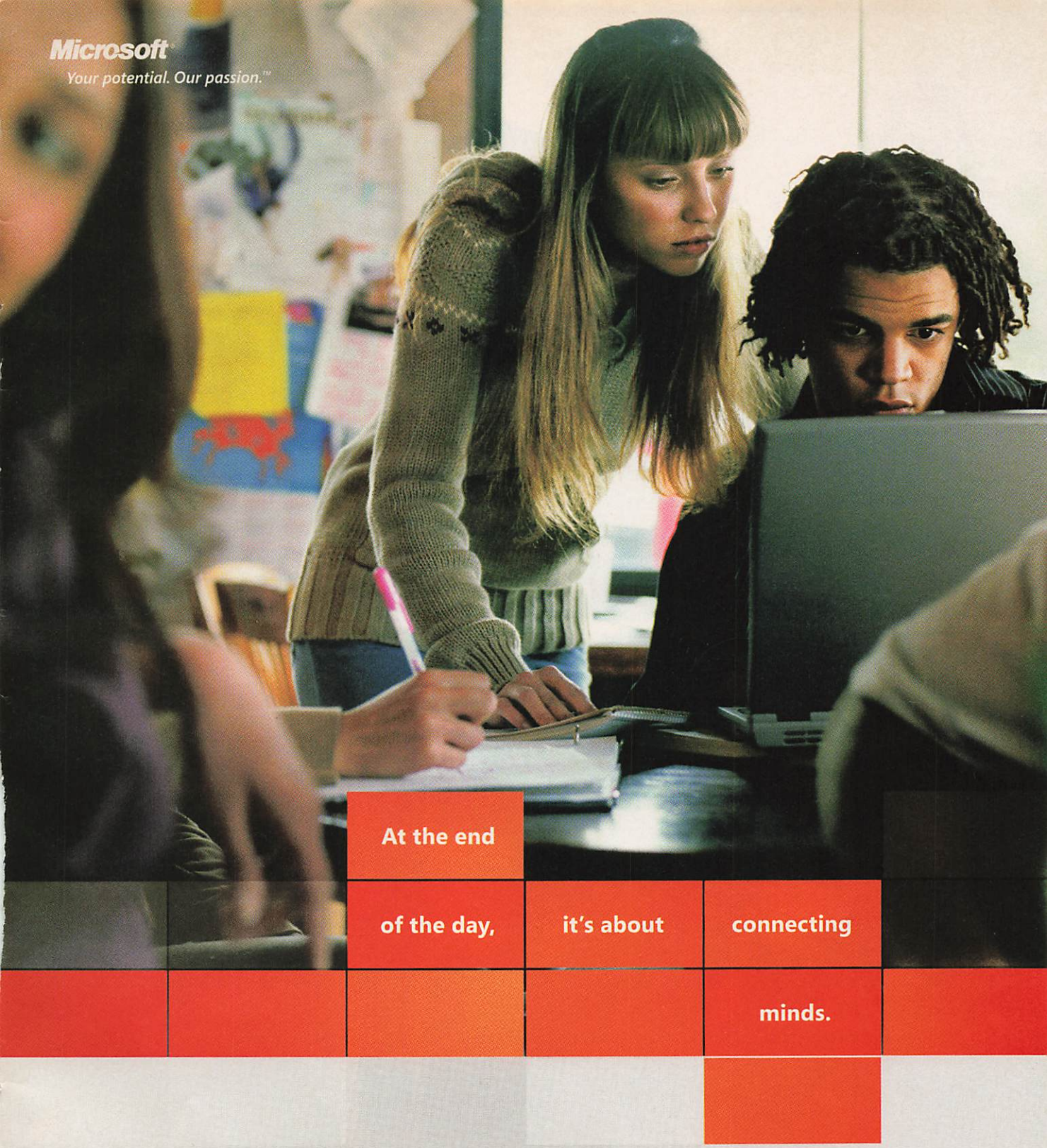
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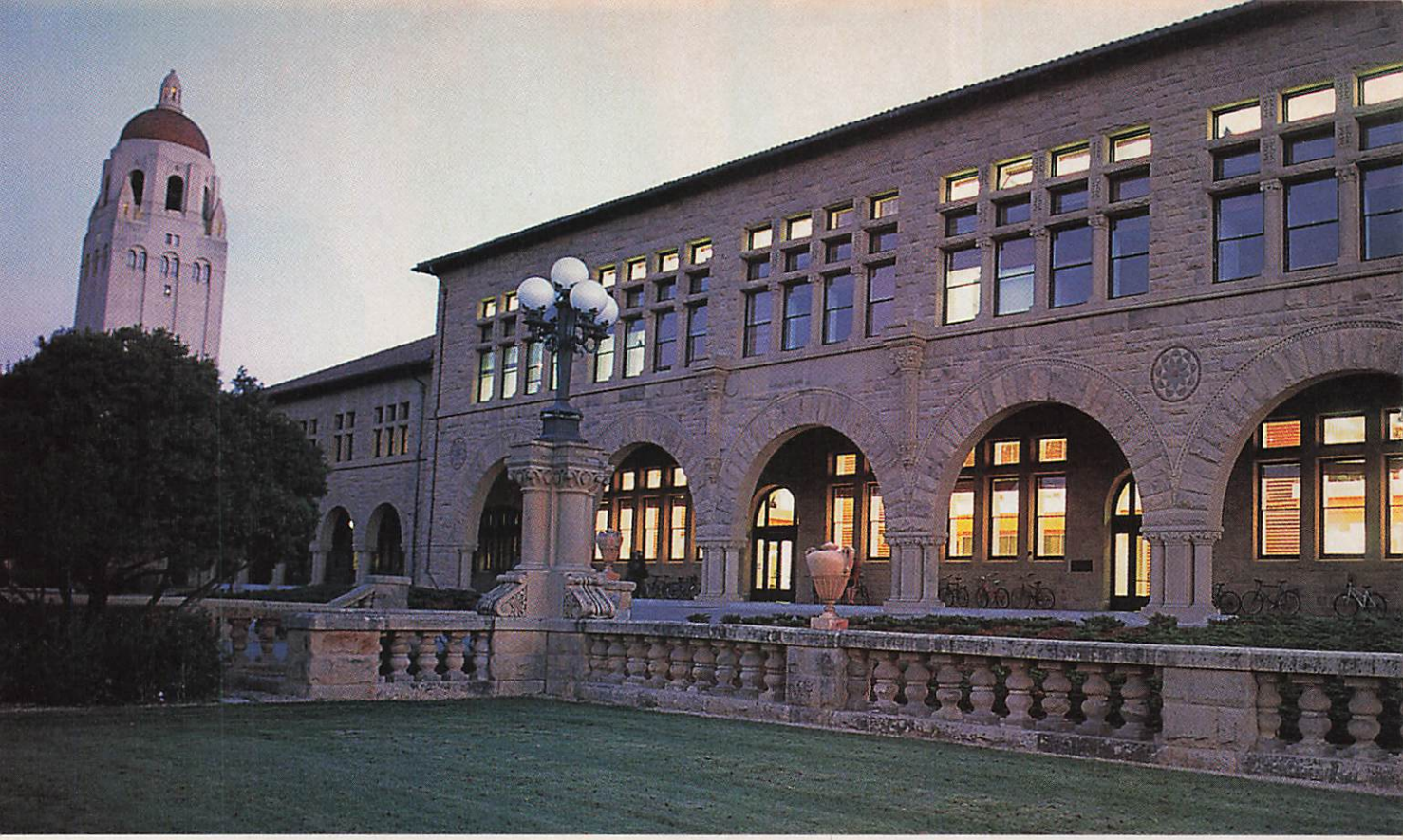
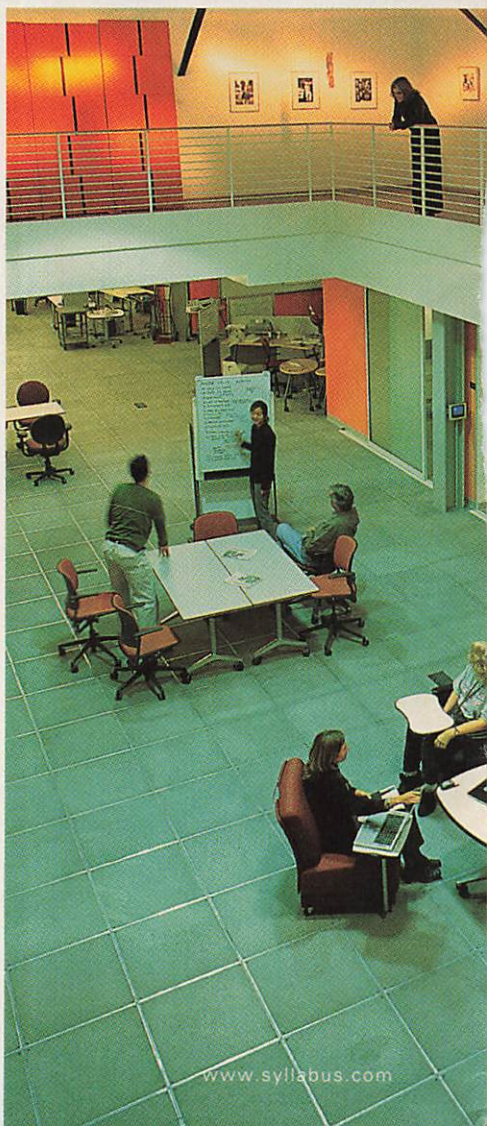
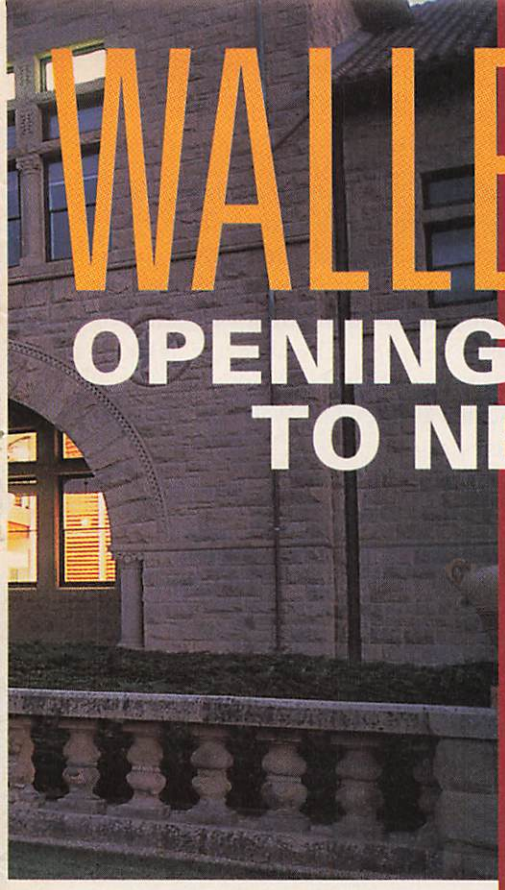




Clockwise from the top:
The front of Wallenberg Hall on Stanford University's Main Quad; open space of Wallenberg Hall's fourth floor—devoted to research and collaboration; students exiting the Peter Wallenberg Learning Theater.

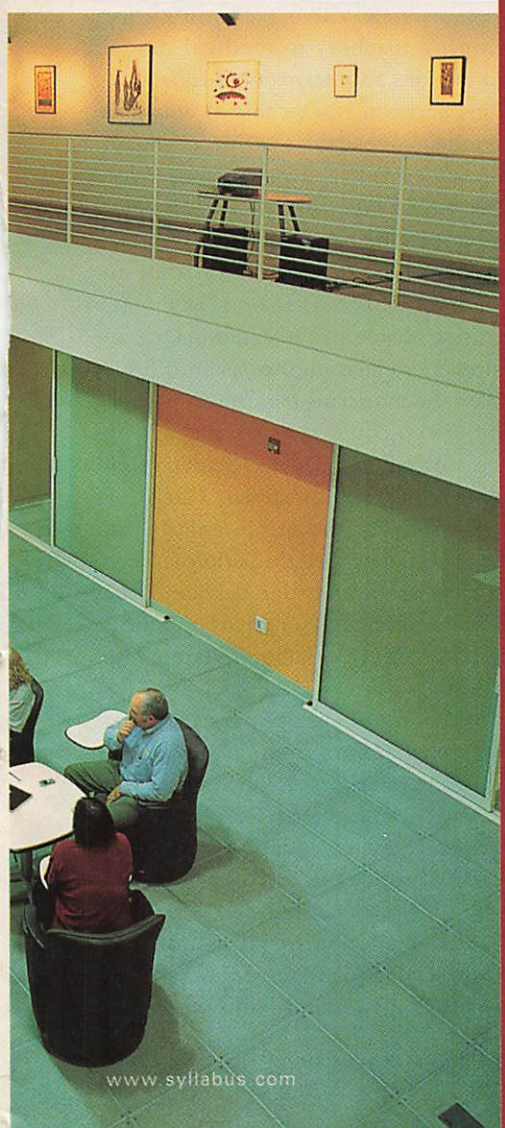


WALLENBERG HALL

OPENING THE DOOR TO NEW TECHNOLOGIES

At Stanford University, one of the oldest buildings has the newest classroom technology on campus.

By Melinda Sacks, Stanford University



Wallenberg Hall, the Stanford University teaching and research facility that is home to some of the most advanced technology available to educators today, is a vibrant center for innovation and experimentation. But the high performance classrooms where professors offer courses from oceanography and Shakespeare to biomedical informatics and engineering aren't just about offering Stanford students the best technologies. They are a part of a thriving community of researchers and scholars dedicated to finding out what technology can do for education, and which technological tools and advances will most benefit students and teachers everywhere.Two years ago, the sandstone building at the front of the university's main quad was completely renovated, leaving only its original exterior. Funded jointly by the university, the Knut and Alice Wallenberg Foundation, and the Marcus and Marianne Wallenberg Foundation, Wallenberg Hall is now a four-story combination of research and teaching space that is pushing the limits of technology in the classroom.

"The building is an evolving laboratory," says Sam Steinhardt, executive director of the Stanford Center for Innovations in Learning (SCIL), the building's main occupant. "Every day, teachers, researchers, and students are experiencing what it is like to work and learn in a setting where the technology is seamless, and where wireless connectivity and our other tools enhance collaboration and interactivity."

From its exterior, Wallenberg Hall matches the other buildings on Stanford's main quad. Walk inside, though, and light floods the two-story open lobby that leads into the Peter Wallenberg Learning Theater. Created for larger gatherings, the Theater has three giant retractable screens, each with its own computer, yet all operated by a single wireless mouse. Presentations can simultaneously include

Photography by Roberto Carra

video, audio, Web pages and even video conferences. Flexible, lightweight furnishings allow the space to be reconfigured in seconds from a lecture hall to small discussion groups around rolling tables. Portable "huddleboards," small stacking white boards, encourage collaborative group work. The windows on the second floor allow students to listen in to classes from above, while the sliding doors into the Theater double as transparent white boards that are often covered with notes, ideas, and outlines arising from class discussion.

On a typical day, the class agenda might appear on one screen in the Learning Theater, a slide listing key points for the session is displayed on an opposing screen, and in the center, a video clip plays. No flipping lights on and off, no starting and stopping a VCR, no hard-to-read overheads. Rather than presenting an obstacle to be overcome in the midst of a lecture or discussion, the seamless multimedia technology makes good teaching better.

Across the hall from the Learning Theater, smaller "loaded" classrooms provide instructors with myriad technological tools to enhance teaching and learning. At the front of the room, two computer-driven Webster digital white boards offer live access to the Internet and the ability to make notations and write on displayed pages with a specialized "pen" that acts as an eraser, highlighter, and note maker all in one. Students can also send their own work—notes, Web pages, or PowerPoint slides—to the Webster boards via their laptops. The Webster system captures everything so that it can be posted to the class Web site for easy access later.

"These classrooms were designed so that instructors and students could make their thinking visible," says Roy Pea, professor of education and co-director of SCIL. "Technology makes possible entirely new representational forms and facilitates the development of new activity systems that can use these forms in entirely new ways."

On the top floor of Wallenberg Hall an expansive research center houses graduate students, visiting scholars, and researchers whose projects span such areas as new video technology for training teachers to medical model simulations to international collaborations between researchers at Stanford and their counterparts in Sweden, South Africa, Germany, and Switzerland.

A recent experimental performance provided a prime example of international networking in the form of an improvisational jam session of jazz musicians in Sweden and at Stanford. Over an Internet2 connection that spanned 5,400 miles, the musicians performed to audiences who could see one another on floor-to-ceiling video screens. Stanford communications professor Christine Samuelson, the principal investigator on the project, described the performance as "erasing space and time barriers." The global experiment could have ramifications for future collaborative teaching between two distant locations.

SCIL's multi-disciplinary teams of researchers continue to evaluate and analyze technologies and their impact on education with the goal of improving knowledge exchange from professor to student, colleague to colleague, and among international affiliates.

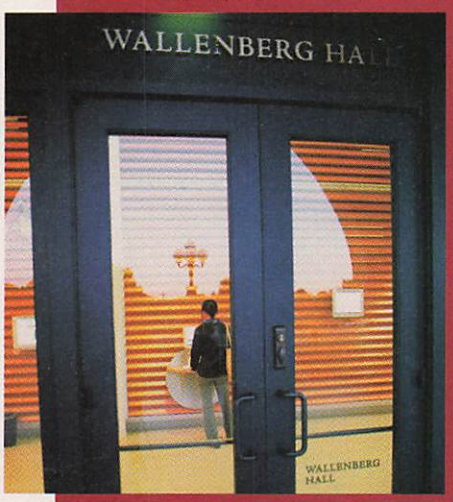
Each Wallenberg Hall classroom offers a platform for a new level of teaching, at the same time serving as

A SHORT HISTORY OF WALLENBERG HALL

The building that is home to Wallenberg Hall was completed in 1900 and was first known simply as Building 160. A massive sandstone structure of 55,000 square feet and four floors, it has served as a library, law school, and political science department over its 100-year life span.

In 1999, Building 160 was selected to showcase Stanford University's commitment to furthering advances in the field of education. The university redeveloped the interior with $9.5 million in grants from the Knut and Alice Wallenberg Foundation and the Marcus and Marianne Wallenberg Foundation of Sweden. The Wallenberg Hall gift is the largest such grant ever made by these foundations, and the first made outside of Sweden.

Today the transformation of Building 160 is complete, unifying the past and the future by keeping the original 19th century exterior, but re-inventing the interior into a 21st Century infrastructure designed to support the technologies of today and tomorrow. From the soaring Peter Wallenberg Learning Theater and technology-enhanced classrooms on the first floor to the prototyping research incubator on the fourth floor, Wallenberg Hall is a working laboratory where the learning tools of the future are being forged.



The vision for Wallenberg Hall as expressed by the founders was to establish a facility that would enable the sharing of experience and knowledge in the use of modern technology in education. Wallenberg Hall provides the facilities for Stanford faculty and researchers to experiment with the use of technology in real courses. At the same time, by working with promising international partners the building's occupants have the opportunity to experiment with and develop innovative approaches that can be used world-wide.

"We are already seeing promising results that indicate we are on the right track," says Stig Hagström, professor emeritus of Materials Science and Engineering and co-director of SCIL. "We must remember that in our enthusiasm, we may sometimes overestimate the short-term effects of the ongoing educational revolution, but we may also grossly underestimate the long-term impact of this revolution."

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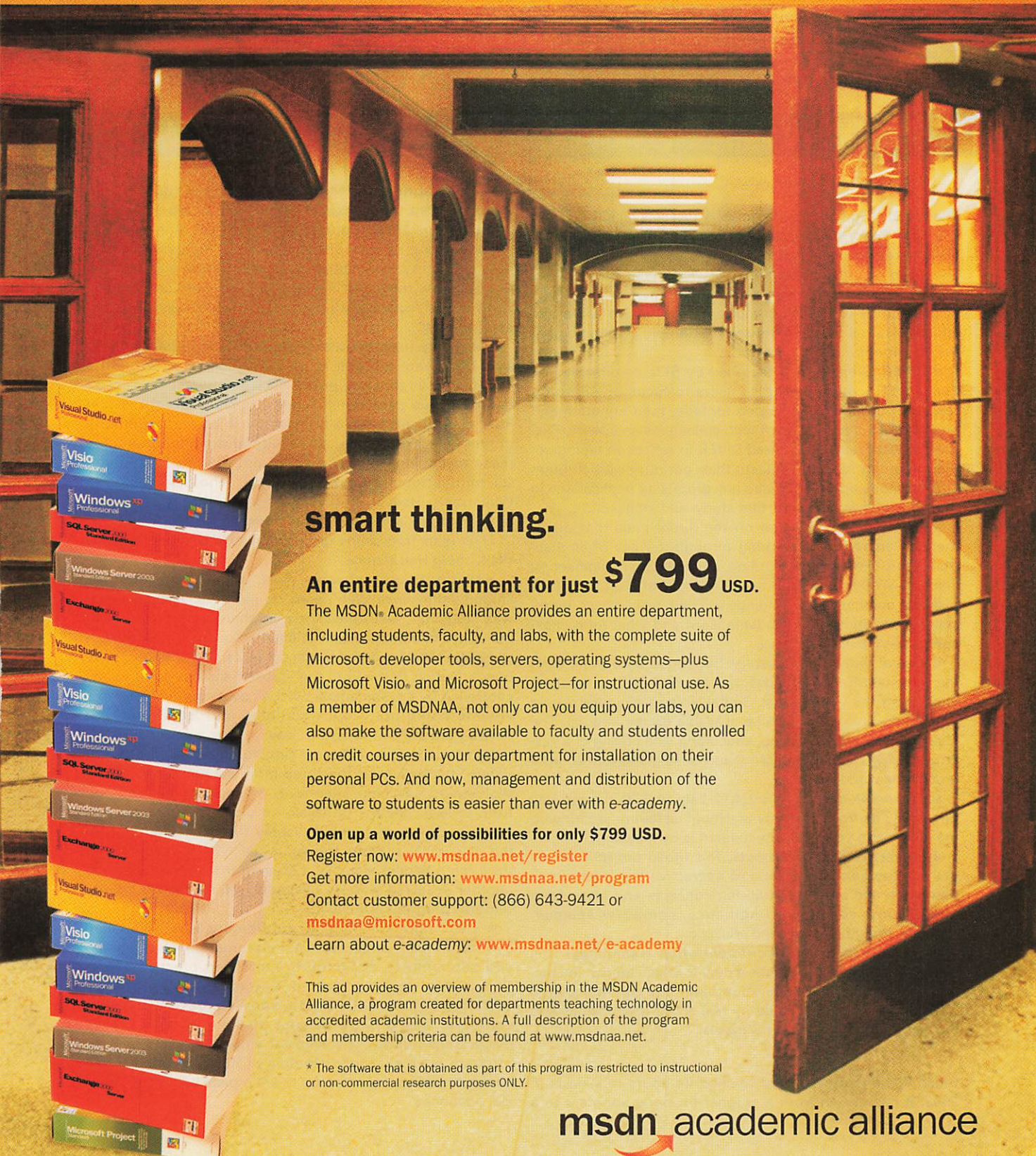

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a laboratory for testing and analyzing the value and potential of new technology. Some of the tools will prove invaluable, SCIL researchers believe, while other tools may not be worth their expense. Such information could prove useful to everyone, from an academic department deciding whether to invest a small amount of money in several tablet PCs for the classroom, to a university redesigning or creating a new multimedia auditorium, to a college seeking funding to reinvent its learning spaces.

"The teaching and research happening here in Wallenberg Hall could be of enormous value to our colleagues at all levels of education regardless of their geography," says Steinhardt. "Wallenberg Hall represents the university's commitment to explore new ways of enhancing learning and education through targeted investments in technology."

RESEARCH AND TEACHING AT WALLENBERG HALL

Research

The broad range of multidisciplinary projects includes:

- ***High-Performance Learning Spaces:*** A multidisciplinary team of researchers is examining two years' worth of audio and video records of Wallenberg classes, related interviews, activity surveys, and focus group data to assess the effects of technology on teaching and learning. Results will assist educators at all levels in how to best employ technology in the classroom.
- ***DIVER:*** Created by a team led by SCIL co-director Roy Pea, DIVER software enables users to focus attention on relevant portions of any video footage, then annotate and analyze the video to share it with colleagues and peers. This year, student teachers utilized DIVER to reflect on tapings of their own teaching to evaluate their performances through "guided noticing." DIVER also has promising applications in the fields of law, medicine, film study, and architecture.
- ***Folio Thinking:*** Based on the hypothesis that documenting and tracking learning through the use of an electronic portfolio deepens learning, students in an engineering class in Wallenberg Hall are the focus of SCIL's current research on ePortfolios. Findings will help researchers understand more about how students learn and what tools most complement their experience.
- ***Virtual Video Collaboratory:*** Supported by a grant from the National Science Foundation, a team of SCIL researchers is creating the world's first Digital Video Collaboratory—a multimedia library that will be available on the Internet. The library will allow the viewing, annotating, and editing of a vast array of useful footage collected and catalogued from sources around the world.
- ***Teachable agents:*** The CAT2 Lab at SCIL, which has developed its own "learn by teaching" software, is studying the idea that a powerful way to learn is by teaching.
- ***Interactive toys and robots:*** This broad project involves the development and testing of interactive toys and robots that teach and entertain, utilizing concepts and ideas from psychology, sociology, linguistics, computer science, robotics, communication, and education.
- ***Social responses to communication technology:*** This new research is examining the extent to which human interactions with computers, television, and new communication technologies are conditioned by real social relationships and the navigation of real physical spaces.

Teaching

Since Wallenberg Hall first opened its doors to classes in 2002, it has grown from a magnet for early adopters to a widely sought-after learning center for faculty and students from more than 20 departments and schools at Stanford University. Courses offered in the high-performance learning spaces of the hall have included anthropology, history, biochemistry, classic Greek, engineering, and Hebrew, reflecting the fact that virtually any subject can benefit from a well-designed, technology-enriched environment.

Every day from early in the morning until late into the evening, teachers and students utilize the frequently updated classroom equipment such as interactive Webster boards, video conferencing tools, in-class laptops, tablet PCs, and reconfigurable furnishings to create a seamless multimedia experience. As faculty and students employ these technologies, researchers from the Stanford Center for Innovations in Learning (SCIL), who also reside in Wallenberg Hall, evaluate and analyze the impact in an ongoing study of technology in education.

Highlights from some of the innovative courses taught in Wallenberg Hall include:

- Using iRoom software, Prof. Russ Altman had his students download Web pages on particular diseases each was studying, then asked them to share the material with the class. PointRight, experimental software, allowed them to "beam" their material to the computerized Webster white board. During discussion, the Webster screens were jointly controlled by the students from their own computers so that anyone could point out highlights and issues without passing around a keyboard or leaving their seats.
- In her course, "Introduction to Hebrew," instructor Vered Shemtov used the three large screens in the Peter Wallenberg Learning Theater to present diverse content, from written poems, to music, to video clips, maps, and artwork. One screen could display the course outline for the day, while another showed a piece of literature and a third ran a related video clip. Moving from one medium to another occurred without hesitation, all controlled by one remote computer mouse.
- The Program in Writing and Rhetoric (PWR), directed by Prof. Andrea Lunsford, is a requirement of all freshmen and sophomores at Stanford. Freshmen practice everything from working individually on their laptops, to working collaboratively in small groups with one computer and a large plasma display, to whole class discussions utilizing the Webster smart boards. The PWR program is an excellent example of how Wallenberg Hall allows teaching and learning to keep pace with technological advances.

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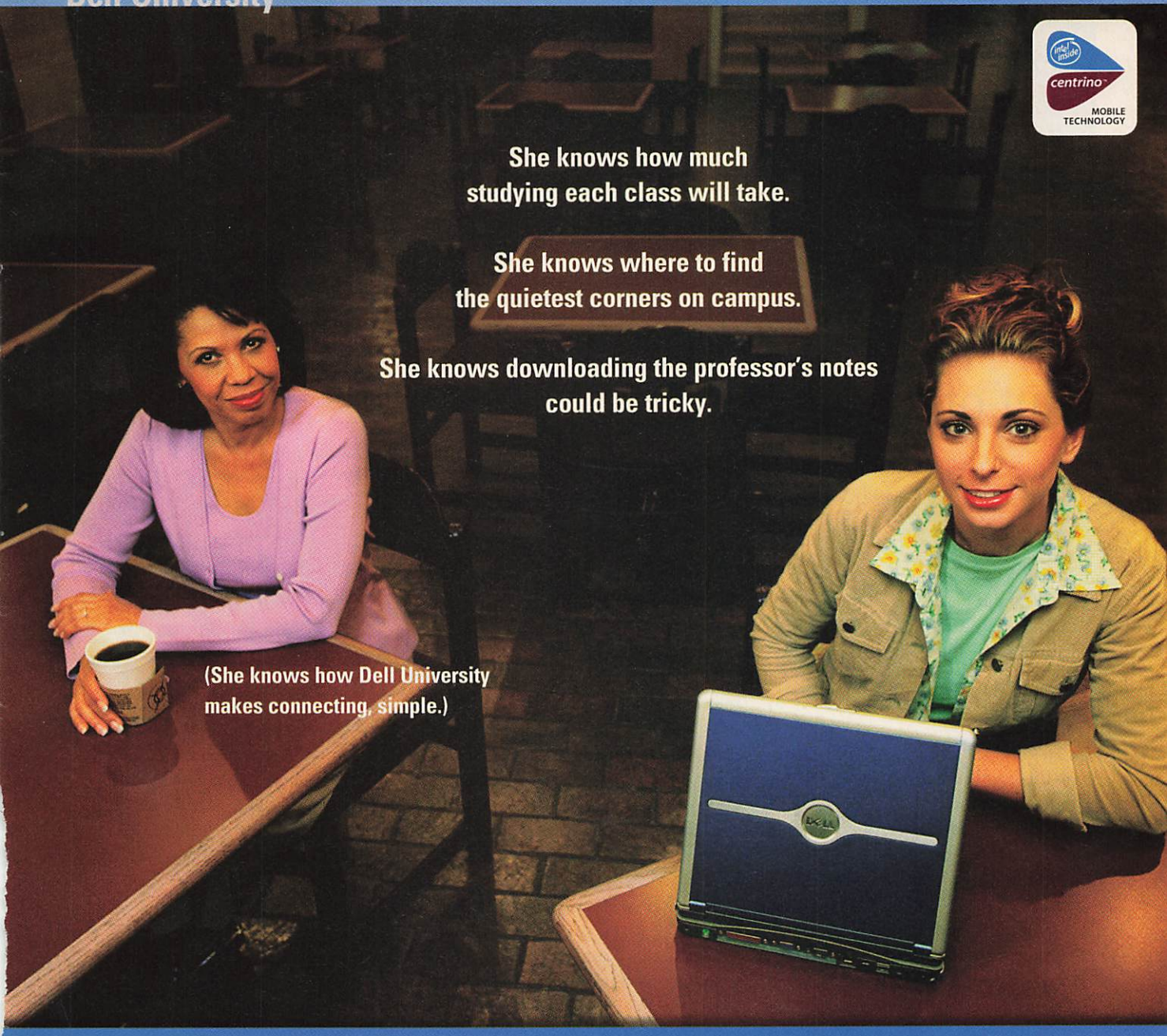
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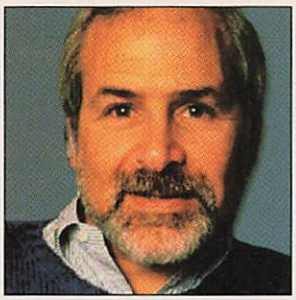

Kenneth C. Green

DIGITAL TWEED

Out of the Box?

July, 2004: I'm sitting on the dock of the bay in San Francisco: it's a clear, wonderfully windy, decidedly bright, "chamber of commerce" Saturday afternoon.

There are sailboats on the water. Tourists and locals mix in the farmers' market at the Embarcadero. People fishing from the dock routinely pull up their lines to replenish the bait eaten by the fish or washed away by the current.

It's a glorious day. An off-line, out-of-the-box, great-to-be-away-from-the-office day.

And then here, as elsewhere, phones ring.

The passing tourists, the folks fishing from the dock, the people selling wine, cheese and produce in the farmers' market: at the sound of the digital tones, we all engage in a Pavlovian response, reaching for our phones.

In the interests of full disclosure, I should confess that on this particular Saturday I am sitting on the dock of the SFO Bay with *Syllabus* contributors Phil Long and Frank Tansey. It's the day before the summer *Syllabus* Conference: we have wandered over to the Embarcadero and then on to the dock following a tasty and leisurely *dim sum* experience at a nearby restaurant.

Our conversation wanders the landscape. It's the easy-going banter of three guys at lunch, talking shop.

In the middle of our lunch conversation Phil happens to place his shiny, state-of-the-art, just-out-of-the-box phone/PDA on the table. Suddenly, I begin to feel a little like Gollum chasing The Ring. (Precious, *precious!*)

The problem, of course, is that I want to upgrade my 3-year-old PDA and 18-month-old cell phone. Both are functional. But I am growing tired of the "Batman" utility belt experience, finding myself laden with multiple digital devices. And this is not the first time in recent months that I have experienced PDA envy.

I want one device, and I want it NOW!

And yes, I want the phone/PDA to work the way I do, rather than have to learn to work the way device does.

Of course this lunch conversation about Phil's marvelous multitasking phone (Precious! *Precious!*) occurs about 90 minutes before the loud digital tones from multiple cellular phones shatter the glorious ambience of our afternoon on the dock of the San Francisco Bay.

Alas, there is no escape. In a fitting fulfillment of the "be careful what you wish for" prophecy, is there any doubt that too many of us live in a (too) wired (and wireless) world?

The emerging world of 24/7 anytime/anywhere access can be wonderfully convenient. But I'm learning, painfully, that anytime, anywhere access can also be a digital siren song: there are times when I feel as if I am about to crash on the rocks!

Anytime/anywhere access goes both ways, suggesting an implied social (digital?) contract. The compelling convenience of our electronic toys has become, for some of us, an electronic leash. There are times when I don't want to answer the phone, respond to e-mail, or have you find me.

I had a preview of the electronic leash about eight years ago when my son, then thirteen, really wanted to get a pager. (Precious, *Precious!*) Why did he need a pager? Who needed to find him when he and his friends were in school for most of the day?

As good yuppie parents, we resisted. It seemed that a pager was little more than a fashion accessory for 13-year-old boys. But then we caved and he got the pager. And lo and behold, we found it worked better for us than for him. The unintended and unexpected benefit of his new fashion accessory was that the pager became an

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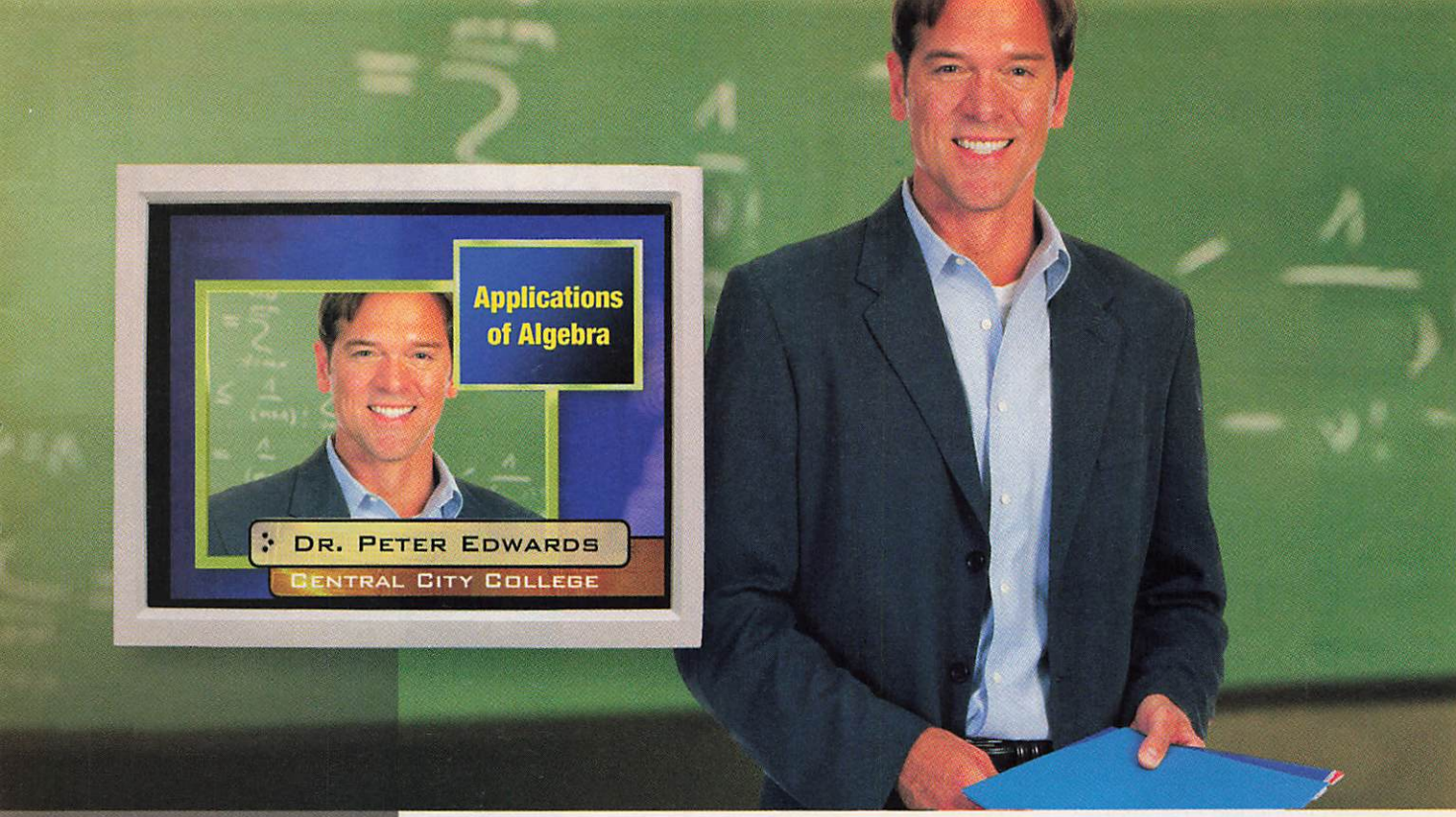
Photography by Wei Yan



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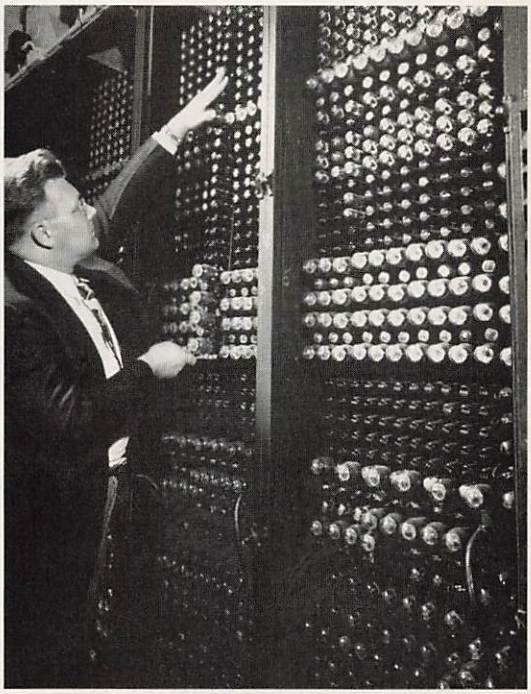
Annie Stunden

CAMPUS ENTERPRISE

Our Critical Production Environments

The giant mainframes of the '80s have been replaced by compact servers and distributed computing strategies. How does that change operations?



The first computer that I ever met was the ANFS/Q7 built by IBM for the U.S. Air Force sometime in the 1950s. I was introduced to the ANFS/Q7 (Army Navy Federal Systems) in 1959. A firm called System Development Corporation (SDC) was hiring and training people to be "computer programmers" for a system called SAGE (Strategic Air Ground Environment)—the first automated air defense system. Not knowing what a computer was or what it meant to be a "programmer", this was an exciting adventure. And a real mind-boggling part of this adventure was seeing the "machine room." The ANFS/Q7 occupied a building that took up about an acre in space. And the building was mostly machine room. The ANFS/Q7 was a vacuum tube, magnetic core memory computer. It had consoles with hundreds of blinking lights that you learned to read, in binary, on the fly. The room was staffed by several computer operators on each shift and also by IBM service folks on a 24x7 schedule. I loved the 1983 movie *War Games*, because the machine room reminded me a bit of the one where I was introduced to my ANFS/Q7.

I was working on parts of the SAGE operating system software in the 1960s, and I can tell horror stories about dropping huge card decks, tangling tapes, and the like. In those days, you tested your program by sending a deck of cards off to the machine room and waiting for it to return with a core dump. At least, that's what you did if you were developing air defense applications. If you were developing parts of the operating system, you scheduled time "on the computer," usually in the middle of the night, and you arrived with your deck of cards to watch the blinking lights with the operator. I loved this stuff. There was some real magic for me in the machine room. And regardless of my tangled tapes and out-of-sequence cards, the computer operators ran the machine room with policies and procedures and the authority to enforce them.

And for me, there is still magic today in the machine room. In my organization, the machine room is currently called "the platform"—I think because of the raised floor. The platform no longer houses one big honker of a machine—but for us it is home to hundreds of servers that run the applications supporting our community to do their work of teaching, learning, research, and administration. Most of our machine rooms are in out-of-the-way places, often in the lower levels of buildings. People who work in them in the winter might never see the light of day. And we tend to forget about them, except when an important system crashes. Then their jobs are similar to the jobs of emergency medical technicians. They are expected to know what emergency actions to take to protect our critical data resources and what experts to round up. Most do this very well. Emergency events tend to happen on weekends or nights when experts are not on-site. But my experience is that these experts can usually be found—because they never turn off their cell phones or their computers at home. They can often log in from home and begin their diagnosis. Between our system operators, our system programmers, and our application

continued of page 57

2:07PM_LOG IN TO HOT SPOT
2:08PM_NETWORK SECURES THIN AIR
2:09PM_TRANSMIT SYLLABUS THROUGH THIN AIR
2:25PM_GRADE MIDTERMS ONLINE
2:35PM_SWITCH TO DECAF

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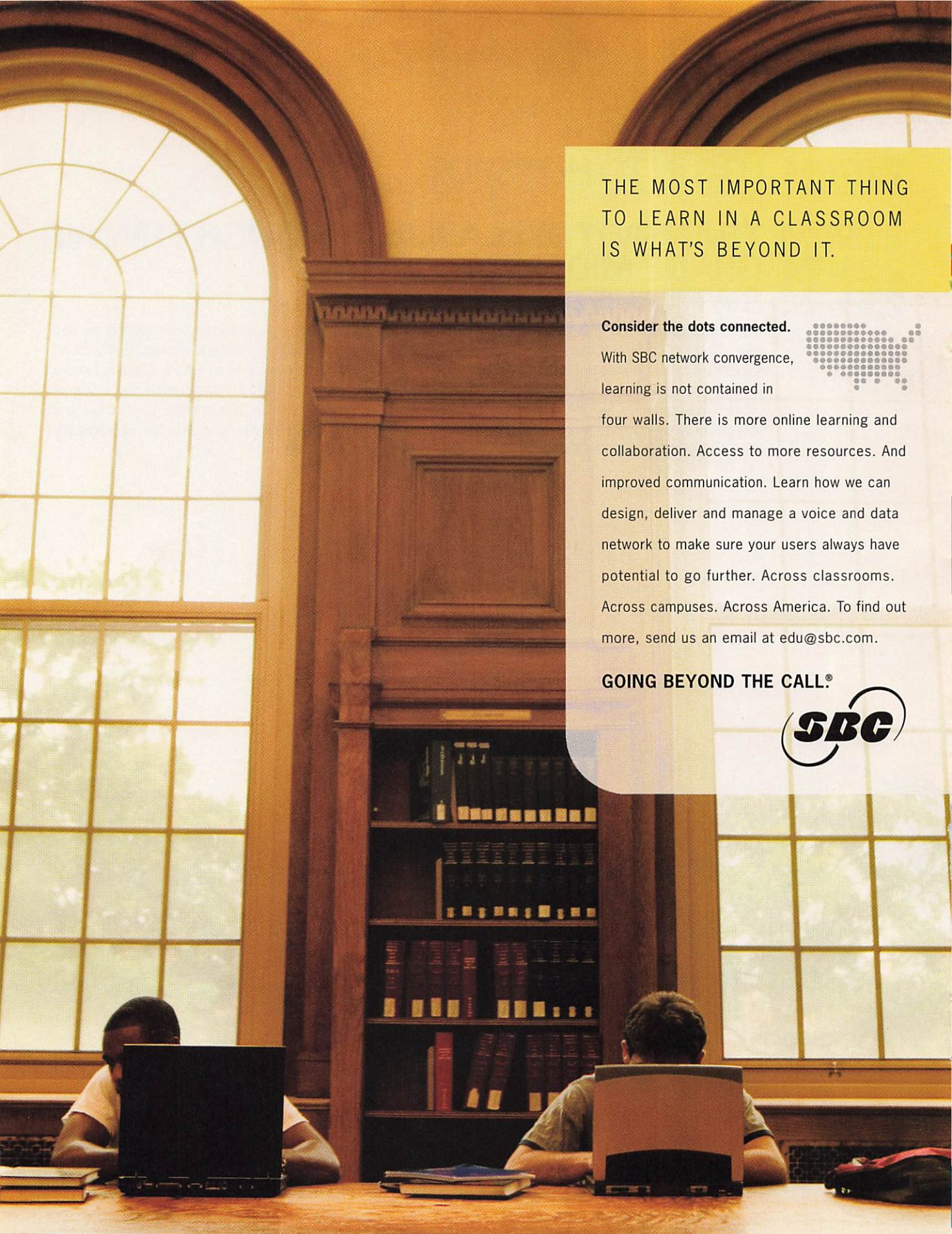
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Measuring Return on Technology Investments Is Hard Work

...but the rewards should be worth it.

By Peter Stokes, Eduventures

There is an old saying in business, "What gets measured gets done; what gets rewarded gets done repeatedly." Unfortunately, there appear to be few rewards to encourage college and university administrators to examine, in a deep way, the financial returns on their technology infrastructure investments. Instead, these investments are frequently talked about in terms of their intangible value: "We want to have a leading IT program," or "We need a more coherent campus infrastructure," or "We are trying to reduce complexity."

Worthy goals, all. But too little attention has been paid to the tangible consequences of implementing large-scale business process solutions like student administration systems, human resources systems, or finance systems. Why is there so little motivation to examine financial or other "hard" returns?

The answers, of course, are numerous. First of all, getting a handle on the precise costs of these systems—even in terms of purchase and implementation outlays alone—can be difficult, partly because projects of this type can take so long to deploy. Also, while total cost of ownership calculations may sound reasonably direct in the sales pitch, it can be challenging to put a boundary around "total cost" out there in the real world. Plain and simple, if you cannot measure the investment, it is going to be hard to measure the return.

For this very reason, return on investment (ROI) is sometimes treated—by providers and consumers alike—as a mere marketing term, and not as something to be taken seriously. In fact, the higher education marketplace is so keen to retreat from the idea of setting financial efficiency or gain as a legitimate management goal in the context of large-scale technology investments that nowadays the dialogue around returns is awash in still foggier—and comfortingly less transparent—notions such as "value," rather than return, on investment.

However, because enterprise resource planning (ERP) solutions remain a top concern for CIOs and other higher education administrators—even as college and university

budgets tighten—it will only become more important for education leaders to learn to effectively measure the benefits that their technology investments yield.

Show Me the Money

Benefits can be divided into "soft" and "hard" categories. Among the "soft" benefits are business process improvements in operational management and the delivery of services to students and staff, such as:

- A shift to *decentralized budget management* that gives individuals and departments much greater control over their budget management;
- An increase in *recruiting yield* with more effective targeting of recruiting dollars;
- An increase in *admissions productivity* with more inquiries and applications processed by fewer staff;
- An increase in *financial aid productivity* with more financial aid applications processed with fewer staff;
- An *optimization of course scheduling* that allows more classes and events to be scheduled with a smaller inventory of classrooms;
- A shift to *Web-based financial aid* systems that allow students to submit applications, view and accept or decline awards, and view transaction balances online;
- A shift to *Web-based course registration* that allows all course enrollments to be transacted and all course grades to be posted online;
- A shift to *self-service human resources* systems that allows employees to self-manage their paychecks, benefits, vacation, and sick leave accruals.

While these process improvement benefits are no less real than any "hard" financial savings, the evidence pointing to them is largely anecdotal rather than data-driven. Undoubtedly, there is a financial benefit associated with each, yet administrators will have to undertake deeper analysis before they will be able to assign dollar values to these improvements.

There are, however, two primary instances in which a dollar value or financial benefit can generally be assigned to system-derived improvements:

- *Budgetary savings* from reductions in paper, print, and mailing costs;
- Staff *avoidance* achieved by using process redesign to increase transaction volumes while keeping staff levels flat.

Budgetary Avoidance

However real, these financial benefits tend to be modest relative to the total cost of the investment. Occasionally, there can be significant "budgetary avoidance" benefits, as well. For example, Texas Christian University found that it benefited from the efficiency gains resulting from the implementation of a classroom scheduling application from PeopleSoft.

Between 1999 and 2003, TCU's Registrar's Office was able to increase by 33 percent the number of classes and special events scheduled, with only a 10 percent increase in classroom space, while staffing levels remained constant. Some of this efficiency gain came from the full utilization of previously unused classrooms, but much of it came from optimizing the number of students per-class, scheduling classes back-to-back, and more effectively locating teachers in their own buildings.

The optimization of classroom scheduling has contributed to higher levels of faculty and student satisfaction and, according to estimates by the Registrar's Office, allowed the university to avoid the need for 16 additional classrooms—the equivalent of two new classroom buildings—at a projected cost of $40 million. [See Eduventures' 2004 study "Measuring Returns: Examining the Financial and Process Improvement Impact of Student Administration, Human Resources, and Finance Systems in Higher Education"]

Discovering the "Hard" Truth About Returns

Challenging economic times require rational economic decision making. For college and university administrators, technology investment decisions are going to require better performance measures. And for that to happen, those measures are going to have to be rewarded.

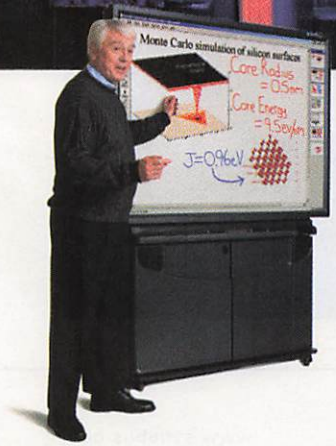
While reduced printing and mailing costs and staff avoidance do have a financial impact, it would of course take some time for these savings alone to recoup the investments in these large-scale technology solutions. Clearly, these systems are having a positive impact on business processes and services to end-users. But the dollar value of these improvements is still unclear.

Over the past decade, the Internet has proven to be a truly transformative agent of change. And administrators have clearly understood that Web-based services make it easier to do business.

While many schools can point to recognizable financial efficiencies, there is still more work to be done by department heads and business officers in calculating the "hard" returns associated with decentralized budgeting and improved recruiting, admissions, and financial aid productivity. When that happens, real returns will yield real rewards.

Between 1999 and 2003, TCU's Registrar's Office was able to increase by 33 percent the number of classes and special events scheduled...

Peter Stokes, Ph.D. *(pstokes@eduventures.com) is executive vice president of Eduventures, supporting the growth of K-12 and higher education.*



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>> SYLLABUS2004 IN BRIEF

Syllabus2004 convened in downtown San Francisco July 18-22 for a full program of keynotes, breakout sessions, exhibits, a full-day visit to the UC-Berkeley campus, and more…

KEYNOTES

>> Five keynotes provided attendees with a range of high-level insights and strategies. Joel Smith, Carnegie Mellon University's CIO (below, left), explains why and how cognitive science should be applied to online course design. University of Wisconsin-Madison CIO Annie Stunden (below) takes attendees along as she wanders through a "technology universe." Other keynotes included Clifford Lynch (UC-Berkeley and CNI), Jeff Schiller (MIT), and Kristine Hafner (University of California).

An audience response system in a large lecture hall on the UC-Berkeley campus provided on-the-spot input to a plenary panel on Open Source CMS, with Charles Kerns (Stanford University), Phil Long (MIT), Mara Hancock (UC-Berkeley), Brad Wheeler (Indiana University), and Kathy Christoph, moderated by Victor Edmonds (UC-Berkeley). ▼

DAY AT BERKELEY

>> A full-day excursion to the UC-Berkeley campus allowed attendees to examine the work of Berkeley's IT experts and explore the historic campus.

▲ Kristine Hafner, the University of California's associate VP for information resources and communication welcomes attendees to the Berkeley campus with a keynote session about the role IT plays in the budget and growth challenges confronting the UC system.

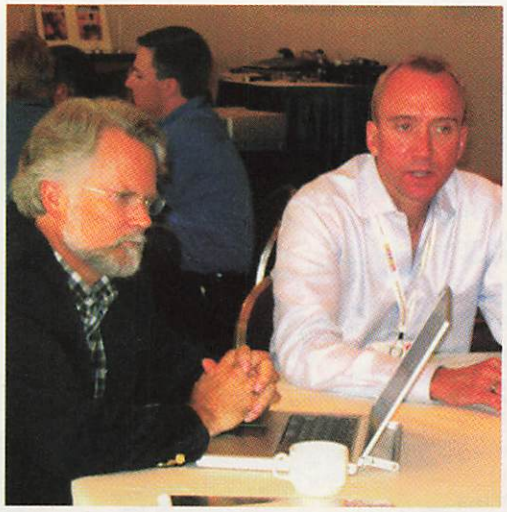
EXECUTIVE SUMMIT

At a special Executive Summit session, Bill Riffee (University of Florida) moderates a panel on Campus IT Investment and ROI, with Brad Wheeler (Indiana University), Ruth Sabean (UCLA), and Rich Pickett (University of San Diego). ▼

>> In its second year, an invitation-only Executive Summit offered campus technology leadership a forum to meet and discuss top issues.

Phil Long (MIT) and Brad Wheeler (Indiana University) participate in an Executive Summit ◀ workgroup on ePortfolios.

Kathy Christoph (University of Wisconsin) shares her thoughts in an open discussion session at the Executive Summit. ▼

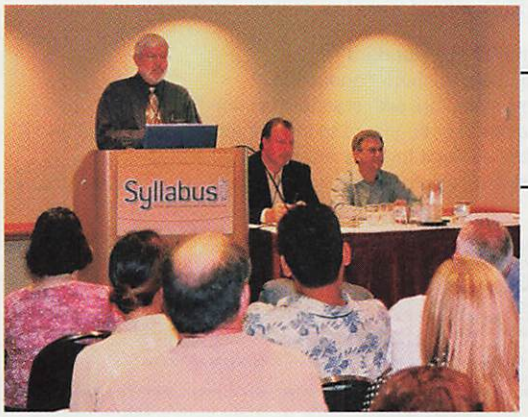


>> Leading companies participated with exhibits, sponsorships, and technology presentations.

EXHIBIT HALL

BREAKOUT SESSIONS

▲ Gary Baldwin (UC-Berkeley) introduces CITRIS, the Center for Information Technology Research in the Interest of Society—one among several visionary breakout sessions offered to attendees visiting the Berkeley campus.



>> Attendees selected from breakout sessions offered in five tracks.

◀ J. David Betts (Univ. of Arizona), Graham Glynn (Penn State), and Stuart J. Glogoff (Univ. of Arizona) during a panel discussion of personal information technologies.

Every Classroom Needs

AirProjector KJ-200

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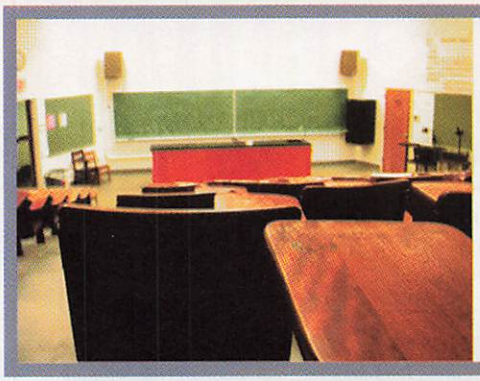
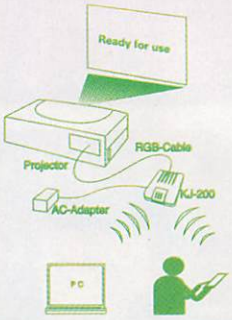


Unleash Your Presentation !



Quick Setup

Win

Mac

(Feature available in September 04)

Moderator

(Feature available in September 04)

Maximize your meeting time with AirProjector KJ200 Standard, a wireless presentation system that unwires you from a hassle of cable connection. Now you can enjoy giving presentations right from where you are, with a single click of a mouse button.

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■ AirProjector KJ200 Standard

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System requirements	Microsoft Windows 98 SE, Me, 2000, XP
Recommended CPU	Intel Pentium 4, 2 GHz or higher
Recommended RAM	256 MB or more
Supported resolution	VGA (640x480), SVGA (800x600), XGA (1024x768), SXGA (1280x1024)
Screen capture method	Real-time video capture/One-shot image capture
Management	Web administration and configuration using standard web browser (Internet Explorer)

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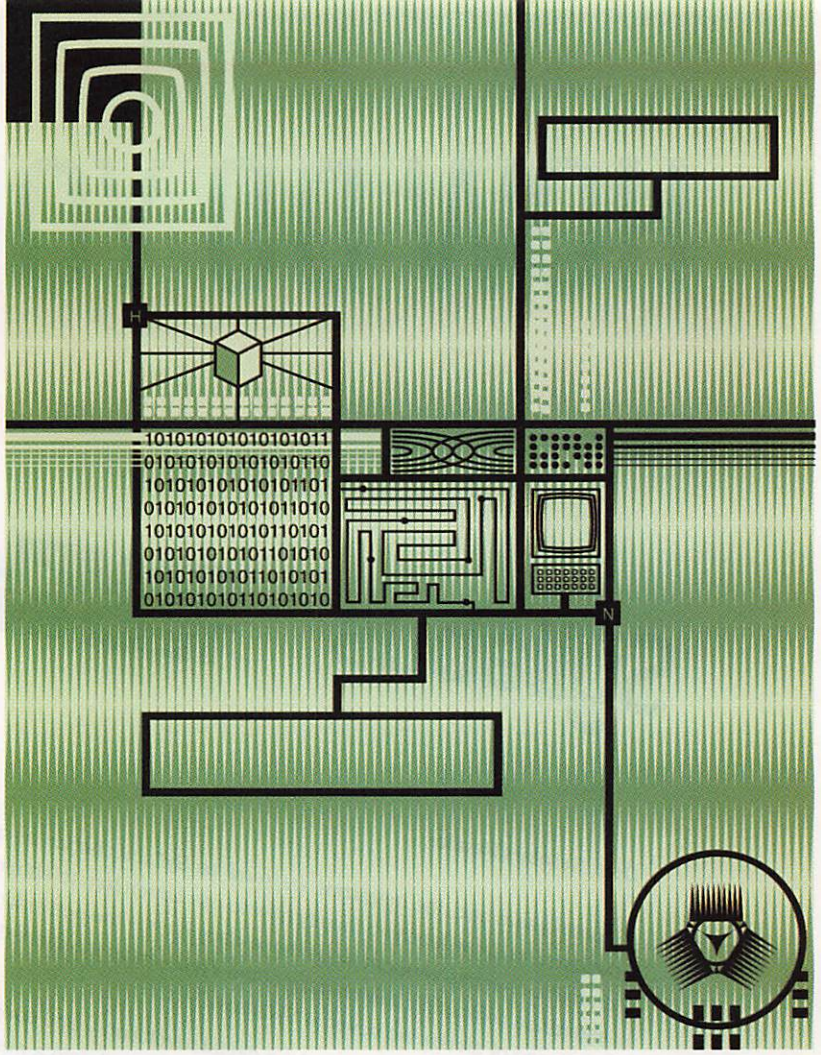
If you could go back in time 10 years, and spend a day on your campus to revisit the information technology environment at the time, it would undoubtedly occur to your 2004-era mind that things were quite different. What would likely strike you immediately is how isolated the campus felt in terms of information flow and information technology networking. Perhaps you would feel as if you were on an island community, advanced in its use of information technology and busy working hard to use networking to extend communication and collaboration across your campus to faculty, students, and staff—but only on the island, not off it.

Now fast-forward through time to your campus today, bringing your fresh impressions from 1994. The comparison that likely stands out most is your perspective of networking—that networking now is much more global and your campus vastly less isolated as an island unto itself. The focus of the institution's information technology networking environment—and yes, even the overall focus of the entire institution itself—is now on connections beyond the campus boundaries.



EVOLVING STRATEGIES FOR CAMPUS NETWORK INFRASTRUCTURE

By Brian D. Voss, Indiana University

Networking infrastructure is critical to supporting the key institutional missions of teaching, learning, and research.

The Evolving Nature of the Campus Network

The advent of the Internet—the Web—and the globalization of higher education as brought about by the revolution in information technology is driving an evolution in the way we think about the campus network. Our network managers can likely document that today more of the traffic that flows across our campus networks is bound to-and-from the Internet (i.e., off our campuses) rather to-and-from on-campus destinations. We are all broadening our horizons, and while we still make use of resources on our campuses, we now are more likely to look off-campus the majority of time. And those same on-campus resources are increasingly used more by Internet users than those located on our campuses.

Whether your institution is research-intensive, teaching- and learning-focused, residential in nature, or a combination of all three—whether you are large, medium, or small in size—whether you are public or private—your institution is impacted in a significant way by this evolution in networking in higher education. Research-focused institutions have concerns about ensuring that their faculty researchers are well-connected into the growing cyberinfrastructure. Research agendas (and thus research grant funding) is now broader, and more global in perspective. Institutions with a focus on teaching and learning must realize that this area, too, is now far more global, both in terms of the course materials brought into on-campus teaching and the outreach via online education to a broader community of students. Institutions that feature significant student-residential foci must accept that there are both pedagogical and recreational components to their on-campus residents' use of information technology

HOW DO YOU MAKE A

SYLLABUS becomes

Syllabus CAMPUS TECHNOLOGY

Dear *Syllabus* Reader,

Sixteen years ago, the magazine we know as *Syllabus* began as a quarterly newsletter designed to show teaching faculty how to use computers to enhance instruction. The dramatic changes wrought since those early days – the networking of systems, the rise of enterprise computing, the ubiquity of the Web – have broadened with each successive year the range of stories we cover in *Syllabus*.

Through all those seasons of the digital revolution – and congruent with the atmosphere of constant transformation – *Syllabus* steps next month into a new name and a new format to more closely reflect the breadth, depth, and pervasiveness of computing in higher education.

With its October issue, *Syllabus* becomes CAMPUS TECHNOLOGY, the complete monthly resource for administrative and academic IT leaders in higher education.

When you turn the pages of CAMPUS TECHNOLOGY next month, you'll see content that reflects the IT realities across the entire spectrum of colleges and universities. Editor Mary Grush and Editor-in-Chief, Katherine Grayson will seek, in Kathy's words, "to provide a unique forum for best-of-breed and comprehensive solutions on campus."

The college campus remains the place where the cutting edge is honed, where bold experimentation is business as usual, where creativity continues to thrive. As has *Syllabus* before it, CAMPUS TECHNOLOGY will continue to honor that spirit of innovation with an unwavering dedication to the community we serve.

Mark Sande, Publisher
SYLLABUS / CAMPUS TECHNOLOGY

GOOD THING BETTER?

CAMPUS TECHNOLOGY

Coming this October... New Look, New Name, Expanded Focus

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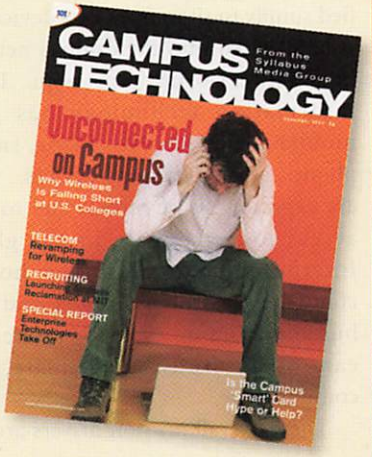
- E-Services
- Admissions/Recruitment
- Student Assessment



CAMPUS TECHNOLOGY From the Syllabus Media Group

and overall residence life experience.

If we are now convinced that indeed, globalization has indeed impacted our institutions (regardless of size, funding, or focus) and we accept that this impact has led to an evolved landscape in networking in higher education, then understanding that evolution and its ramifications for network strategies and funding is of importance not only to CIOs, but to all parts of the institution—administration, faculty, students, and staff. The key feature of this evolved network landscape is that now, not only are our campus networks of strategic importance, but so too are the connections of our campus network to the broader Internets (the commodity Internet and advanced Internets and cyberinfrastructure supporting research).

Driving Forces

Today our campus networks are driven by the mission of the institution, which is becoming global; campus networks need to link students, faculty, and staff on our campuses to the world beyond our campuses, not just to each other.

Today our campus netwoks are driven by the mission of the institution, which is becoming global.

The overall driving factors include the evolving nature of research, teaching and learning, and the service missions of our institutions.

As well, institutions need to realize that our constituents are becoming far more mobile. No longer are users satisfied simply to sit in front of a device that is hard-wired into the campus network in an office, lab, or dorm room. Today, information technology has gone mobile—with laptops, PDAs, smartphones, and other small devices. Users are expecting to be mobile and to have access to participate in the global Internet not just from their homes, computer classrooms, offices, and labs, but also from every space where they can work, study, investigate, and communicate.

These overall mission drivers are also impacted by events that are driving the foundational architectures behind them, including:

- Broadband pricing—We need to find ways to get control of the costs of these larger pipes and find ways to reduce the marginal costs of expanding, as that expansion is linear or geometric over time.
- Security and reliability of the network—We now are much more concerned about who is connecting to our networks, and how and where our network is open to access.
- National cyberinfrastructure—There are now more Internets to connect to; among them Internet2's Abilene Network, the Teragrid, and National LambdaRail.
- Mobile computing (WiFi)—With the pervasiveness of information technology today, we need wireless networks to enhance and expand the connectivity available on our campuses (and off).

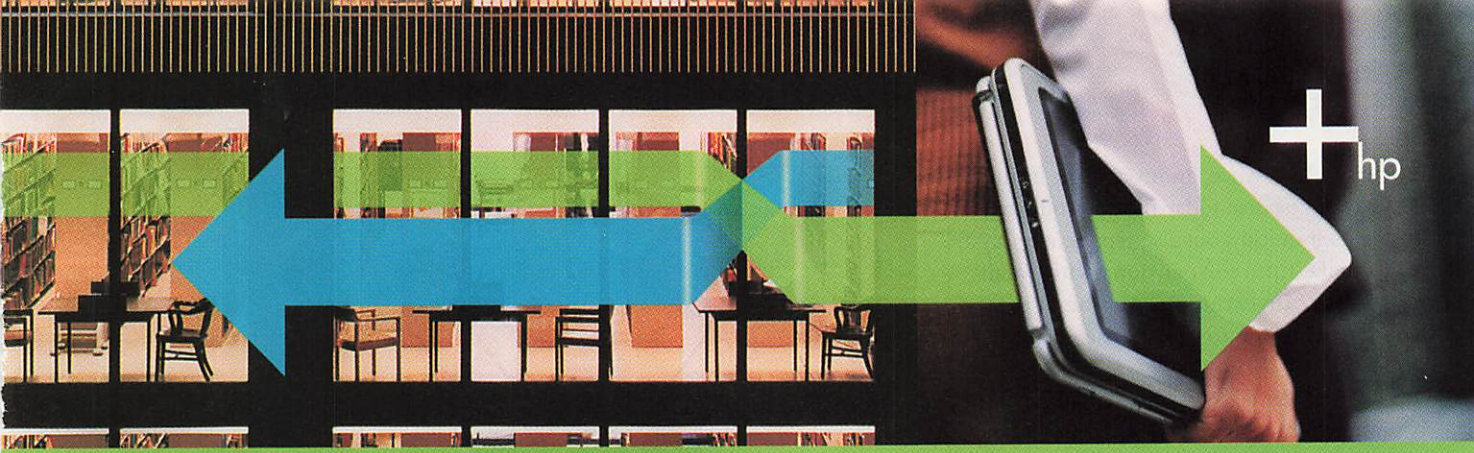
What Are the Opportunities?

As our institutions seek to develop their campus network strategies, there are opportunities to be seized—not just additional expenditures to be made. While no CIO will likely ever (nor should ever!) state "... this is completely a one-time expense," there is the opportunity to make strategic one-time investments that can control future ongoing expenses, to the point where budgets can be maintained at close to zero-growth while not hindering the advancement of the institution's ability to serve its community. Specifically, wireless connectivity (WiFi) that expands on-campus network access, and dark-fiber connections to the Internet(s) that extend the campus borders to strategic access points, are areas of opportunities to be examined, where a one-time investment can pay great dividends and may be easily maintained within existing ongoing budgets.

Wireless infrastructure today is more affordable than it was at its outset. Access points are now only a few hundred dollars each (some as low as $150) and no longer require expensive-to-install power connections (they get power from the network, much like a telephone). Even very large campuses can often install a broad-coverage WiFi network for under $500,000, with a life-cycle replacement cost of about $140,000 per year (3-year replacement cycle). Smaller campuses can get by for much less. And with the continuing drop in hardware costs for wired networks, it is quite possible to, over time, absorb this additional expansion of the network into existing, base budget funding models.

Integrated communication strategies are more than the convergence of voice, data, and video applications onto a single network. The real driving factor in this area is the broader development of mobile communication technologies (laptops, PDAs, smartphones, and so on) that are pushing the campus network to grow beyond the "walls with wires" model to accommodate access to these devices. Wireless networking has reached maturity and its deployment at universities has the potential for radically changing the way they do business.

Acquiring a dark-fiber connection between the campus and the nearest major network peering point is another example of an initial capital investment being amortized very quickly when compared to the costs of broadband services leased from providers. And right now, for perhaps a limited time, there is a glut of dark fiber underground in many of our states and communities (put there during the dotcom surge in the late 1990s and never lit). This fiber can sometimes be acquired at fire sale prices, and it represents a capital investment that replaces an ongoing expense (though some component still is needed for operation and maintenance). But perhaps more importantly, once acquired, it provides a very scalable platform for expanding connectivity as costs for high-speed communication equipment follows the usual diminishing marginal cost



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curve. In essence, an investment in this kind of resource today may not only pay for itself quickly, but also represent a way to make future expansions with small capital investments, rather than increasing ongoing expense commitments.

Then there is the advanced Internet component. There is significant activity going on nationally, both in the development of national cyberinfrastructure as well as regional high-speed optical networks (RONs). The direction being taken by a growing number of higher education institutions and consortia of institutions is to own (or acquire long-term leases) on dark fiber. This provides the institution with an asset that can be scaled as technology develops to provider higher and higher capacities of connection, as those capacities are needed by the function of the information-technology-enriched institution.

On the national front, initiatives such as National LambdaRail are driving the broader research component, providing very high-speed "waves" (10Gbps connections) that will link individual researchers or campuses to foster research collaboration. Regionally, many states have either acquired, implemented, or are planning acquisitions and implementations of optical fiber networks to link their institutions to each other and to the developing national cyberinfrastructure. These RONs are becoming the segmented "quilt" pieces, which are being woven together to create the national-level cyberinfrastructure.

Figure 1 shows the relationships quite well in this symbiotic process involving campus, regional, and national connectivity development. Elements include campus researchers, campus infrastructures, RONs, national experimental and optical infrastructure, and dark fiber. Each element is both an enabler and motivator of the other, resulting in a process by which advances are driven in all areas.

And of course, we still have the on-campus wired infrastructure to maintain. A solid foundation of wired infrastructure remains the cornerstone of any campus network strategy, providing high-quality network access to users at their desks, in their labs, in classroom, and in their residences. It is well-recognized that a wired infrastructure will, for the foreseeable future, provide much higher bandwidth than a wireless infrastructure can. Therefore, WiFi is an extension to the campus network, not a replacement for a well-connected desktop. And it makes no sense to acquire a massive pipe to the Internet(s) when you can not distribute that connectivity well on your campus. But it is the case with wired infrastructure, that drops in the pricing of equipment (per port costs) can help the institution keep pace with advances in technology as budgets are held constant, or even are constrained.

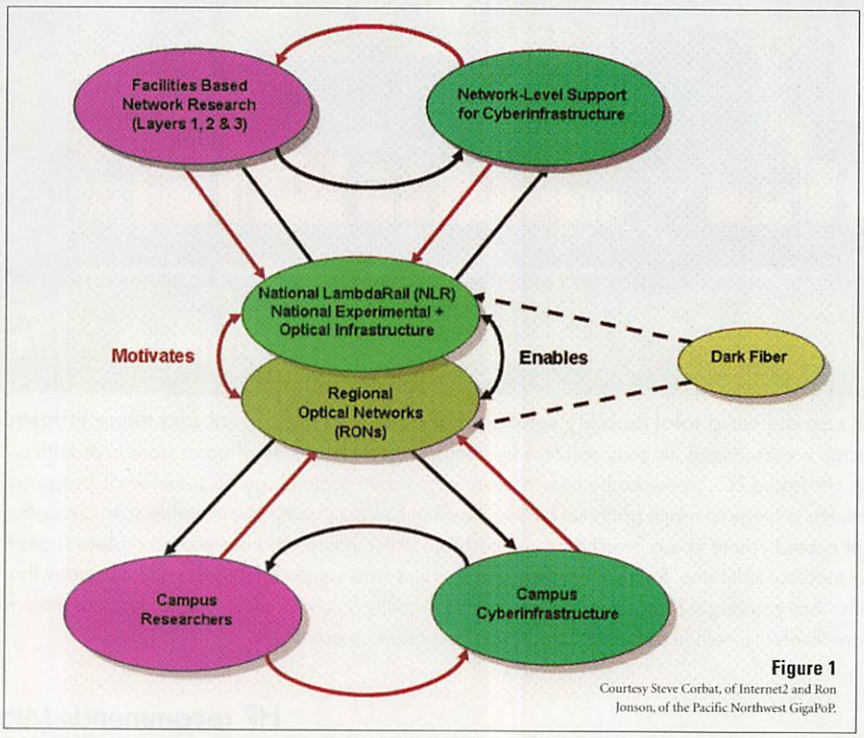

Figure 1
Courtesy Steve Corbat, of Internet2 and Ron Jonson, of the Pacific Northwest GigaPoP.

Upgrading Key Areas

If your institution can't "do it all" right now, look for ways to build portions of your network as "showplaces," in an effort to capitalize on putting the newest technology where it will do your institution the most good. IT organizations that are forming strategies are often hung up on homogeneity—wanting everything to be the same, new, top-drawer, and funded. Yet, perhaps only a key portion needs to be done today; better to have a multi-phased project with funding secured for the initial phase than to spend years trying to find funding for doing everything in "one shot." A good example of this scenario involves upgrading on-campus wiring.

Today, the most advanced users and devices (perhaps five percent of the population) can make use of 100Mbps speeds with the promise of Gigabit to the desktop on the horizon. This is leading some CIOs to consider wire-plant upgrade strategies to bring their 10Mbps-capable wiring up to the higher standard—across campus. This is how it was done before—massive wire upgrade installations in the 1980s and 1990s. But does everyone really need 100Mbps? Maybe your physics department, your informatics and computer science school, or your engineering college needs it? Maybe your advanced visualization facility needs it? But does your physical plant? Do your enrollment services, finance, and other administrative offices? Likely not. A key pervasive application that drives bandwidth use is desktop video conferencing; but the popular desktop video conferencing devices using H.323

compression do just fine with well under 1 megabit speeds. So don't invest where you don't absolutely need to; save that funding for other areas and take a wait-and-see approach to an all-encompassing wireplant upgrade.

Which area of your campus networking strategy can be most effectively advanced with a smaller investment, if funds are truly constrained, will differ on an institutional basis. But the key concept should be to do what you can, when you can, anyway you can and make even piece meal advancements (using "budget dust") than to sit idle, thinking only of how to fund a large-scale plan if the funding isn't likely to materialize.

Presenting Your Campus Network Strategy

Campus network strategies, to be both successful and of high value to the institution, must flow from the institution's overall strategy for information technology, which should be based upon the primary institutional strategy for its role in higher education. Without a firm understanding of the institution's mission and strategy, and of how information technology more broadly fits within that mission and strategy, it is difficult to develop a stand-alone campus network plan.

Part of an overall strategy for information technology, the campus/institutional network—both physical and human in the staff that supports it—should be portrayed as a fundamental strategic asset for the institution. A good next step is to take stock of your current campus network environment. Key factors to examine are the technology and its age, replacement value (i.e., how much would it cost to replace everything with more modern equipment to perform similar functions), and the budget currently being spent to maintain it (in capital, expense, and human resource). The last is critical, in that the three elements are tightly linked, and investments in one can be sometimes offset by reductions in another due to modernization.

Since most every university believes that its faculty is its heart, involving faculty early and often in network planning is a good choice. Researchers will be better able to help administration understand the value of network investments that support their research efforts (i.e., bring in grant funding). Faculty can better articulate the value of information technology and the improved flow of data to their pedagogical activities. Students will be better able to motivate investments by the institution if it becomes clear that information technology in general, and network access are critical to their learning, advancement, and ultimately in helping articulate the factors that influence their choice in institutions. All can do this better than the CIO alone, who may be viewed suspiciously as only wanting new toys and to pad his/her portfolio.

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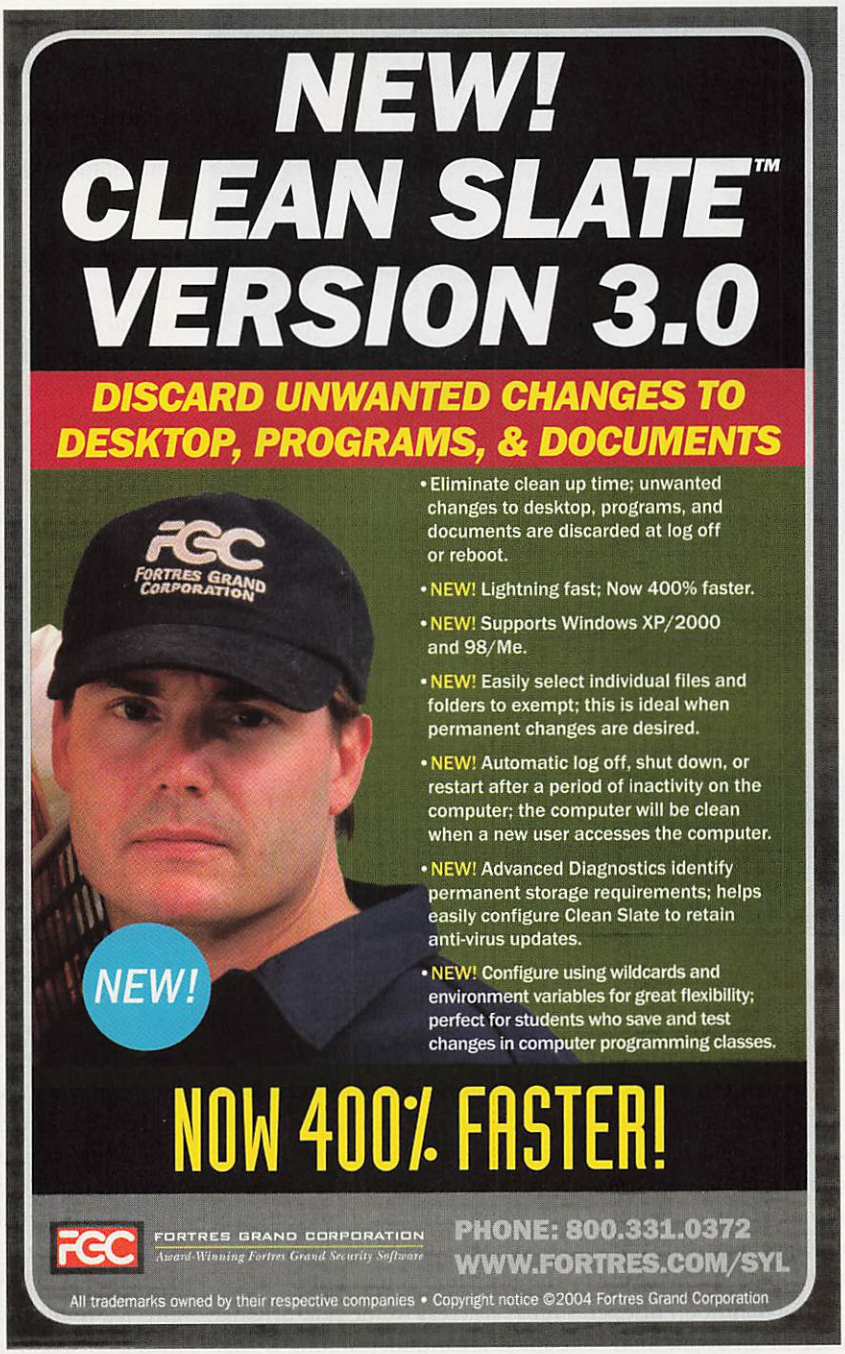
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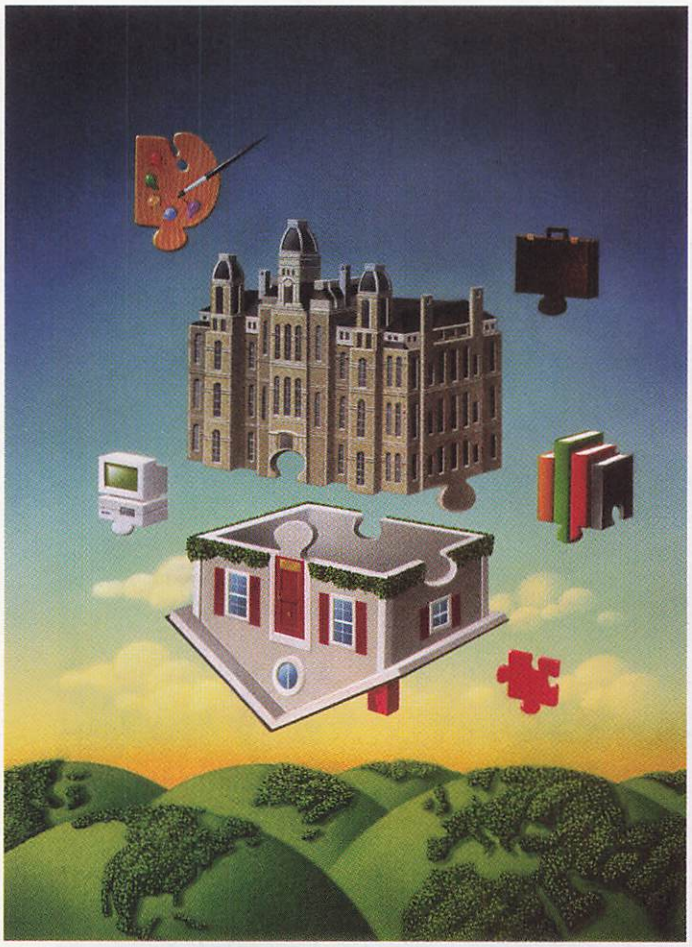
Values of Community Source Development



To help us understand open source in the context of higher education, Lois Brooks lays a groundwork based on the work of some of the best thinkers in the software development world. **By Lois Brooks, Stanford University**

There are a lot of projects underway in higher education institutions right now that are pushing software into open source. Open source isn't new, of course, and in the 30 years that it has been a viable model for software development, some common practices and values have emerged. The structure and beliefs of the open source community are increasingly present in higher education. In recent years a trend toward community-based projects has emerged, where institutions pool their talent and resources to develop products for use by the education community.

The definition of open source is access to the raw, original code of an application. The intellectual underpinning is that the code itself is at liberty—the source itself is available to anyone who wishes it. Others can modify, extend, poke around to learn, or whatever they wish. The notion is not that open source is free of cost, though often there are no licensing fees. Open source is not free of cost. It costs someone to make it, maintain it, write documentation, and so on. It also costs to learn to use, install, and modify it. This is an important distinction to make as we reflect on the many inter-institutional open source projects that are emerging in higher education. We need to think about open source not as a product or as a way of distributing code, but rather, as a philosophy about how we develop tools in the higher education community.

The projects emerging today are strategic, and they are intended to engage other people in the process from their inception. The model for these projects, called *community source,* is a hybrid of the two most common methods for developing software as described in Eric Raymond's foundational essay, "The Cathedral and the Bazaar." (Raymond, 1999)

The Cathedral and the Bazaar

The *cathedral* defines software developed in a typical business situation, such as when we deploy ERP systems on our campuses. It is carefully architected and engineered by experts working in an isolated project team. The cathedral doors open when the construction is complete. The cathedral process works when the problem you are trying to solve is well-understood and the way people will use the software doesn't change very often. The project team constrains access to the software through focus groups and beta testing, and while feedback is accepted, it rarely changes the direction of the project. The responsibility for success rests with the project team.

The cathedral model has distinct advantages. Top-down decision making helps assure that the efforts of the IT staff are directed to the priorities for the institution. It also allows us to invoke the planning needed to meet the rigid deadlines under

Illustrated by Theo Rudnak

which we work—start of school, graduation, and so on.

There are disadvantages as well. The project teams are often not in touch with the user community. Also, teams are constrained to the talent available locally. Perhaps the biggest problem is one of economics: Institutions cannot afford to build everything they need with small, closed, internally funded teams.

In contrast, Raymond offers the model of the *bazaar* to describe the open source world. Many people come together to create something that is larger than anyone could accomplish on their own.

The work of Linus Torvalds and the Linux community is the exemplar of a successful open source project, though there are many other successful projects as well. When Torvalds was a graduate student, he posted a note on the Internet asking if anyone had thoughts about a new version of the mimix operating system. The response was immediate and strong, and 10 years later we have a fully open source operating system that is in use on one-third of the Web servers in the world, a system that is widely held to be better than its commercially developed counterparts (Weber, 2004). It is a remarkable accomplishment. A community of volunteers works without pay, at their own pace and skill level, on whatever they want to do. In the case of Linux, hundreds of developers are active at any one time.

Successful Models

In the excellent book, *The Success of Open Source,* Steve Weber discusses several aspects of the Linux community that have contributed to its success. They include:

The community is made up of people who are interested in the software and the technology enough that they want to work on it on their own time. Some people are deeply involved and are heavy contributors, others less so.

The large community is leveraged in useful ways. When a problem or bug is found, or an idea is generated, the likelihood that someone can solve the problem or absorb the task is much greater than on a small team. A secondary benefit is that the open communication allows participants to know when a problem has been solved. They can look to the community for solutions before reinventing the wheel.

Open source communities are known for the lively and frank interchanges of ideas on discussion forums. Exposing all ideas to the community for conversation, allows good ideas to be generated and vetted by the community.

Successful open source projects are well-led and well-organized. Linux, Apache, and Unix have systemized ways that final decisions are made on critical things like whether code becomes part of a final production release. The organization and governance structures provide a balance to the community involvement.

Simply stated, the more people who are available to a project, the better the ideas, the greater the ability to absorb a task, the faster the work gets done, the more quickly bugs are fixed. With a greater talent pool from which to draw, it is less likely that one person will cause a bottleneck as work queues on his or her desk.

There are two fundamental problems with adopting this model wholesale for all of our projects. First, we are not all volunteers, so real money, and hence, the keen interest of our institutions, is involved. Second, it is not likely that our institutions are willing to bet the next release of a mission-critical system on the goodwill of people we only know by their screen names. We need to acknowledge that our institutions have finite budgets, no tolerance for downtime, and that we have hard deadlines. If we are deploying a new version of the CMS, it had better be done before the budget runs out; it had better be ready to go when school starts. We need control. This means that we need structured, managed projects.

Raymond presents two contrasting models, one very controlled with predictable outcomes, the other harnessing the minds of many to create a rapidly evolving product. There are aspects of both methodologies that are being extended and modified to fit the higher education environment.

The notion of harnessing the best of our brains is appealing. We know what we want, we know how to design, build, and deploy software. The sheer volume of expertise and talent in the higher education community is a huge asset for gathering ideas and creating tools.

Like the people who self-select into open source projects, institutions that opt into a particular community are motivated to work on the projects. They might be interested in the technology or perhaps in the functional aspects of a project—something draws them to it. They have an interest in getting something done. The challenge, then, is to align ourselves with each other when the ideas and timing mesh.

We need to think about open source not as a product or as a way of distributing code, but rather, as philosophy about how we develop tools in the higher education community.

In successful projects, the people who participate have developed ways to work collectively and to communicate effectively. We have a long history in higher education of inter-institutional research projects. It is a short step, then, to leverage our collective talent by working together on the development of tools. This allows the best ideas to emerge and helps to avoid reinvention of the wheel.

The collaborative projects emerging in higher education are beginning to combine elements of the cathedral and the bazaar to allow us to capitalize on the elements of each in ways that fit our needs and environment. This new hybrid model is community source.

The New Community

Who makes up the new communities

that we are forming? First, we find colleagues at other institutions who have similar goals, similar responsibilities, and similar timing around what they are trying to get done. We form community source projects around a common desire to get something done. The work on Sakai with Stanford University, Indiana University, MIT and, Michigan is a perfect example of this. In higher education we are uniquely suited to collaborate because we are not in competition with each other. There is no loss of income or blurring of our distinct identities when we work together on software projects. We only gain from the collaboration.

A second key component of community source projects includes the commercial partners who can provide the product support that adopters will need. The Gartner Group highlights commercial support of open source eLearning products as critical to their long-term viability (Yanosky, 2003). In the case of uPortal and the Open Source Portfolio Initiative, commercial groups are partnering with universities on the development of the products, and on Sakai, they are entering the community as support providers. Engagement of the commercial support providers helps the projects because they have expertise that university developers typically do not have, most notably, experience with many different campus environments. Also, having vendors engaged helps assure wider adoption of the open source software. People who rely on the support provided by software companies when a product is purchased are able to utilize open source products because reliable support structures are in place.

Third, our communities include funding agencies, who provide seed funding to the projects and are increasingly engaged in shaping goals, forming alliances between project groups, and using their contacts to help the community structures develop.

Finally, the new communities include all of higher education and potentially, K-12. The emerging projects are formed with a desire to engage the community in much broader ways. In part this is tightly coupled with our values as academics. We share knowledge rather than keep it to ourselves. There are also economic motivators, which include both lowering the overall cost of development to our institutions, and fostering enough movement in many projects so that we can adopt new tools as well as develop our own. However, a vibrant community requires active participation. MacKenzie Smith, et al., write, "Achieving true community requires the transformation of users who are initially consumers into stakeholders." (Smith, 2004)

The emerging projects are formed with a desire to engage the community in much broader ways.

Considerations for Stakeholders

What does it mean to be a stakeholder? It means that as a community we have a vested interest in the success of a project, which comes from adopting, using, and relying on the tools. This begins by expanding the factors in our decision process to include adoption as an option to the traditional buy/build. Brad Wheeler counsels that there is a complex equation of elements in such a decision. Criteria include fit with the institution, user needs, costs for acquisition, maintenance and support of a system, and the current priorities of the institution (Wheeler, 2003). A school cannot afford to build everything or to participate as a contributor in every project, so each major decision requires that we review the options available to us. The cathedral model is well-known for its benefits and shortcomings, and we may continue to build applications in-house at times or make decisions to purchase commercial products when it is expedient. Adoption is also a choice. There is much less fear among IT leaders now about open source than there used to be. When a well-established open source choice is available to us, say Linux or Apache, there is really no question about adoption. None of us would take on the task of writing Web server software now when we can quickly and easily adopt something.

Wheeler also counsels that we consider to what extent we wish to control our destiny. The community source efforts demonstrate the commitment to this control by the institutions that are contributing resources. The emerging question for IT leaders is that of adoption of the products developed by community source groups. The open code is now a key factor, since institutions may extend, change, or modify in small or large ways. The criteria for decision making can now include the question of whether an institution wishes to customize the features or the look and feel of a product for local needs, as well as the extent to which integration is needed or desired. Of course, sometimes the best choice is to just install a piece of software and not invest in local modifications. The community source products will need to stand on their own merit.

The question of support often arises when considering the use of open source software. The engagement of commercial support providers in the community source efforts offers a tangible benefit to the institution considering adoption. The decision about the software can be decoupled from the decision about a support provider. If there are several companies available to support a product, they can be selected through RFP, and if their service is not satisfactory, another can be selected.

Values and Community Source

One significant value of engaging in the community source process is that it teaches us to look more widely, to be more accepting of things "not invented here," and to think more strategically about the build/buy/adopt argument.

It almost goes without saying that being part of a community source project is enriching for everyone involved. Peda

continued on page 46

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- **Cornell University** deployed a wireless LAN technology called BeaconWorks from Chantry Networks.
- **Long Island University** spearheaded a telecommunications network supporting a broad array of state-of-the-art services, including worldwide distance learning.
- **Syracuse University** was hit hard by the MyDoom virus in August 2003. As a result, they implemented a disaster recovery system.
- **Loyola University-Chicago** set up a three-tier architecture linking three city campuses.

Cornell University ▪ By Kevin Baradet

Cornell University Unplugged

One of the hottest technologies to hit campuses nationwide is Wi-Fi. Unlike a typical slow and steady technology adoption curve, pre-installed wireless chips in laptops, such as Intel's Centrino, have resulted in a rapid increase in demand for wireless access on campus. In fact, Wi-Fi is becoming a factor for students deciding on a university in which to enroll.

Home to more than 20,000 students and 10,000 faculty and staff each year, Cornell's network infrastructure supports wireless-enabled laptops, PDAs, Tablet PCs and other handheld devices in 45 buildings, as well as locations across campus where users assemble most, such as classrooms and study areas.

Although Cornell had the foresight to predict this surge in wireless network traffic, many large universities face significant challenges with the deployment of wireless networks—including scalability, manageability, security, and the impracticality of placing wireless switches in every wiring closet on campus—a daunting task for roll-out and maintenance. Cornell University opted for a better system—routed wireless networking. After intensive testing of several wireless technologies, The Johnson Graduate School of Management at Cornell University deployed Chantry Networks' BeaconWorks wireless LAN system in early 2003. The goal of Cornell's next-generation WLAN deployment was to meet the unique requirements of different wireless user groups; implement a fully integrated network infrastructure that can be centrally managed; lower the cost of ownership and network management; lower the administrative overhead and headaches a switched wireless system can create; and provide greater wireless coverage across campus.

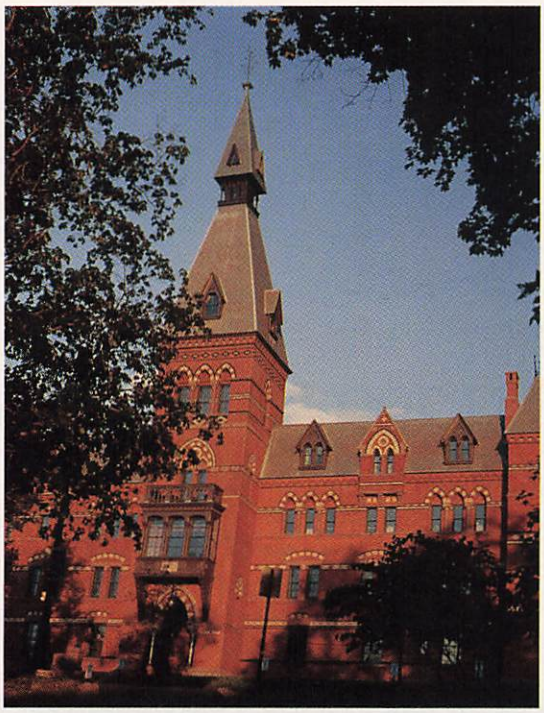

Photo courtesy of Cornell University

The S.C. Johnson Graduate School of Management occupies the ornate, red brick Sage Hall. Sage Hall was built in 1875 and is located on Cornell University's main campus in Ithaca, New York.

Solving the Wireless Equation

Rather than build an entirely new wireless network, Cornell wanted to extend its existing wired network to incorporate not just wireless access, but a state-of-the-art wireless infrastructure. Deciding to take a phased approach to campus-wide wireless, The Johnson School of Management at Cornell University needed a system that would increase the size of its network over time, support all current and future industry standards, and offer out-of-the-box interoperability with its existing wired and wireless networking equipment. By building BeaconWorks around Layer 3 architecture—the same architecture that serves as the foundation for the Internet—the network was able to deliver scalability and availability beyond Cornell's existing infrastructure.

Chantry's BeaconWorks uses IP (Internet Protocol) as the access medium between its BeaconPoint access points and BeaconMaster WLAN router. With BeaconWorks, the School can centrally manage hundreds of access points and thousands of mobile users campus-wide. Layer 3 wireless architecture also allows BeaconWorks to easily interoperate with Cornell's existing routed and switched networking equipment.

Lessons Learned in and around the Classroom

Through the testing and implementation of a variety of wireless networking technologies, Cornell established best practices that can apply to most universities considering a phased or large-scale wireless deployment.

- Any large-scale deployment requires access points that are inexpensive to install and maintain, but also provide great coverage. A state-of-the-art wireless network needs to operate with the quality of service of a wired network—not that of a cellular network.
- Successful wireless networks are developed in a collaborative process. Having a champion to voice the requirements of the users and shepherd the trial phases is vital to a smooth transition, satisfied users and appropriate deployment of network administrators.
- While one would think cellular access would be inhibited by Cornell's surrounding environment of mountains and gorges, in fact, it is the use of concrete in older buildings that blocks cellular signals. By using a Layer 3 wireless LAN, the school can have fully functioning devices and pagers.

Cornell University is building a wireless network without boundaries.

- Look for additional features. Eventually, professors will want to limit students' usage of devices during lectures and class time. A wireless system that provides virtualization (separate virtual networks) is essential to implementing a measure of control in the classroom.
- Choose systems that interoperate with existing network equipment. No business should build a wireless network from scratch. Time, money and resources used to create wired networks need to be leveraged. As a result, be sure to select a system that is backward and forward compatible.

Leveraging the Big LAN on Campus

Cornell University is building a wireless network without boundaries. Wireless networks are no longer just about access—they are about changing the way we interact with others using new dual-mode phones, computers, and other wireless-enabled devices.

Cornell's wireless initiatives continue to attract students, increase the productivity of all constituents, and help propel the university's reputation as a world-class institution of higher education.

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Long Island University ▪ By George Baroudi

Blazing New Communication Trails

Long Island University serves more than 31,000 students across six metropolitan New York campuses in Brooklyn, Brookville, Southampton, Brentwood, Rockland, and Westchester, as well as a university center. Because it is geographically dispersed, with a single administrative center, inter-campus communications are essential to the smooth functioning of the university.

But we learned that inter-campus communication was also prohibitively expensive and redundant when we began performing a cost analysis to provide insight on how to fund a more sophisticated network. For instance, we found the university network was relying on 27 T1 lines for telephone service, 21 T1 lines for data and two T3 lines for Internet. This TDM-based connectivity was costing the university more than $29,000 a month with four service providers.

We believed that a Gigabit Ethernet (GigE) network would eliminate the prohibitive T3 loop charges and provide the infrastructure to support the distance learning initiatives the university was eager to deploy, but we needed to develop an ROI model that would help those in charge of writing the checks to see how the initial cost outlay would translate, in the long term, into greater cost savings and efficiencies.

For help with the GigE network—as well as the ROI model—Long Island University turned to Lightpath, the business telecommunications services division of Cablevision Systems Corporation. Long Island University and Lightpath designed a metropolitan GigE system that interconnects the once disparate networks into a single larger geographically defined network—linking the C.W. Post (Brookville), Brooklyn and Southampton campuses via a 2.5Gbps (OC-48) optical network—and creates the first end-to-end educational network on Long Island.

The added bandwidth supports IP telephony for intra-campus, inter-campus and long-distance communications. It allows Long Island University to move from its TDM-based distance-learning program, which is distracting and difficult to watch because of the "Max Headroom"-like delays between sound and picture—to a premium, jitter-free model. The new fiber optic network supports video broadcasting which, among other exciting possibilities, allows Long Island University to broadcast graduations online so that friends and families throughout the nation can log in and participate, should they not be able to visit in

person. Long Island University's radio station, will also gain a ubiquitous presence by the additional speed acquired.

We initially positioned the Metro GigE connection to the university as a cost-saving initiative. If you have a strong relationship with your telecommunications provider, such as the one we have with Lightpath, you actually make them a partner that can show you how to add service without adding cost. The additional cost-cutting allowed LIU to have the funds to invest in a back-up fiber optic provider in case of primary link failure.

For example, Lightpath provided Long Island University with an analysis of the pre-GigE inter-campus telephone patterns that helped us build the case for a GigE investment. With Lightpath's help, we identified approximately $2,000 that was being spent on calls going from Southampton to Brooklyn each month and nearly as many coming back from the Brooklyn campus during the same period. That analysis helped us sell the pitch for the Metro GigE investment because we could prove that the initial outlay would eventually recoup—in Brooklyn/Southampton telephone calls alone—nearly $4,000 a month.

It's imperative to have a vendor that has a staff capable of delivering according to your individual topography. One of the ways we did that with Lightpath was to go to technical meetings with their senior engineers. In doing so, we became confident that Lightpath could deliver what we expected of them. These site visits were extremely important as they enabled us to see firsthand how their Network Operations Center was run. In addition, we were able to observe a site at which a similar initiative had been rolled out. It was an invaluable part of the process.

Ultimately, by looking backward and forward with equal measure, and by trusting the right partner, the road ahead wasn't so much about doing more with less, as is so often the case these days, but rather doing more *for* less.

What is Gigabit Ethernet?

Gigabit Ethernet is a transmission technology based on the Ethernet frame format and protocol used in local area networks (LANs), which provides a data rate of one billion bits per second (one gigabit). Gigabit Ethernet is defined in the IEEE 802.3 standard and is currently being used as the backbone in many enterprise networks.

Gigabit Ethernet is carried primarily on optical fiber (with very short distances possible on copper media). Existing Ethernet LANs with 10 and 100Mbps cards can feed into a Gigabit Ethernet backbone. — WhatIs.com

George Baroudi *(george.baroudi@liu.edu) is chief information officer at Long Island University.*

Syracuse University ▪ By Michael Kearns

Securely Backing up Syracuse University

In August of 2003, Syracuse University was hit with the MyDoom virus. During the downtime, hundreds of workstations re-booted themselves every ten minutes while administration spent time rebuilding and patching servers. Server outages can be catastrophic to the university, depending on which server is involved. For example, the lighting and temperatures in some labs are maintained via our energy servers. If this were stopped, the cost to the university and loss of reputation would be immense.

With the growing number of viruses proliferating across the Internet and affects of the MyDoom virus fresh in memory, Syracuse University started looking at a number of disaster recovery systems. They needed a system that could take a reliable snapshot of a server's existing state at any given point in time without taking the server down. From that "hot" backup, the university needed to be able to quickly restore the server back to a clean, working state if the server ever experienced system corruption due to a virus attack or faulty system update. After examining the available options, Syracuse University chose the rapid, point-in-time restoration capabilities of V2i Protector from Symantec.

Syracuse was able to make real-time, disk-based backup and enable disaster recovery, as this system is designed to capture and encapsulate all files and configurations in one easy-to-manage backup file. Syracuse is now able to create full and incremental backups throughout the day without interrupting user productivity. It can restore failed or crippled systems back to an exact point in time without taking hours to rebuild, reconfigure, and restore systems from tape or other offline media.

Easing Recovery

Several factors have contributed to the effectiveness of V2i Protector in performing online backups at Syracuse—its minimal impact on server operations, speed at capturing data, and sector-based imaging that enables it to back up files while in use. For example, a SQL Server database is basically a huge open file. Using this Symantec system, the SQL Server at Syracuse University can be backed up and then restored to a completely different box. It comes up without any data loss, just as if it had been rebooted.

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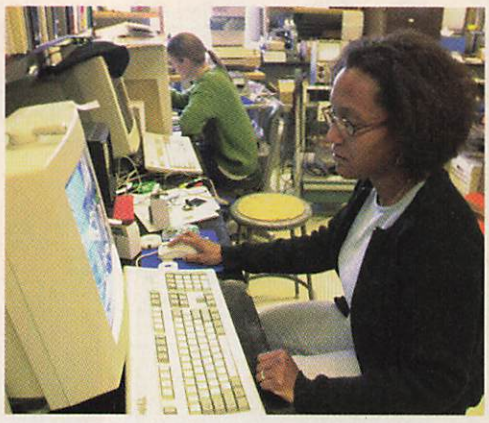
On a weekly basis, Syracuse uses V2i Protector to automatically perform full backups of the university servers. A schedule dictates when the backups run, what's backed up, where the backup images should be stored, and then V2i Protector executes as directed, eliminating a lot of the manual processes associated with backups.

The time to restore a down server has decreased drastically. When restoring from tape-based backup, the process took from eight to 24 hours, not to mention the chance of running into unreadable tapes, corrupted files, or simply not finding the correct files. As a disk-based backup, Symantec's backup system is inherently reliable and will also automatically send e-mails to notify users regarding the success of backup jobs.

Before implementing V2i Protector, the university was hesitant to apply several software security patches for fear of having to rebuild a server. Too often servers can't handle a patch correctly or some other problem with the patch would occur, resulting in significant server downtime. With patches arriving on a weekly basis, the university couldn't afford to keep exposing itself to the adverse side-effects.

The capabilities of the university's new backup and recovery system were recently tested during a domain controller upgrade, one Friday afternoon, when the server suddenly became inoperable. Syracuse's fallback plan simply takes a snapshot image of the operating system volume right before applying a patch. If the patch causes problems, the server can be rolled back to the exact state it was in before. Within 15 to 30 minutes, servers can be up and running.

Moving forward, Syracuse is building an off-site location for disaster recovery to allow the system to be more encompassing. It also plans to look at how to further integrate security and storage/backup systems to improve response times during virus outbreaks. The sooner a malicious threat can be identified by security technologies, the better the chance of making clean backups of mission-critical servers and patching the vulnerability without being exploited by the threat.



Syracuse University adopted a new backup and recovery system after being hit with the MyDoom virus in August of 2003.

Michael Kearns *(mgkearns@syr.edu) is a systems administrator for Syracuse University.*

Loyola University-Chicago

Taking Preventive Action Against Performance Problems

Loyola has four campuses, three in the greater Chicago area and the Rome Center in Italy. Loyola's nine schools and colleges include arts and sciences, business administration, education, graduate studies, law, medicine, nursing, professional studies and social work. Loyola's total enrollment is 13,000 students, which includes 7,500 undergraduates; students represent 50 states and territories, and 82 foreign countries.

Loyola University-Chicago was jumping from the mainframe computer era straight into the Internet age. Loyola University-Chicago had decided to decommission its old main frame and set up a three-tier architecture on its metro-area network, which links three city campuses. The Peoplesoft 8 family of Web-enabled enterprise resource planning (ERP) applications would be the foundation of an administrative portal enabling students to register online for classes, view grades, read campus news, seek financial aid, deal with billing issues and more.

Though Peoplesoft 8 was an emerging solution for educational institutions, a number of other schools had already taken the leap. But rumor had it that the new applications were plagued by performance problems.

"We'd heard some universities had just kept adding more servers to try to speed application access, but it wasn't helping," said Jerry Sanders, Loyola's chief information officer. "So we went in knowing that, even if we acquired a lot of server hardware, we would still have to deal with application performance issues. We had no mechanism in place to do any load balancing, a capability we knew would be critical."

Then Sanders and his staff came across an article detailing the deployment of Peoplesoft 8 by another school, Santa Clara University in Silicon Valley. Santa Clara had been one of the earliest users of the Web-enabled version of the popular Peoplesoft ERP application suite, and had tried a number of solutions, including adding servers and using performance management/tuning software. Finally they had installed a new network appliance from Redline Networks of Campbell, Calif. (designs and manufactures network appliances) Redline's EIX 3250 enterprise application processor is a multi-function platform that performs load balancing, data

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compression, TCP connection management and other server-offload tasks. Santa Clara's application performance problems had disappeared.

Voice of Experience Leads Loyola to Solution

Before putting the EIX 3250 to work in front of Peoplesoft 8, Loyola's manager of server operations tested the unit on the university's internal GroupWise e-mail/collaboration application. The EIX 3250 was installed in February 2004 between Loyola's routers/switches and two GroupWise Web servers. "We had been looking at adding another Web server for GroupWise—at a cost of at least $7,500—and possibly a dedicated load balancer as well," Sanders said. "But after the Redline was installed, users immediately commented that they saw a big performance improvement. They assumed we had put in a new server."

The success with GroupWise gave Walt Slazyk, Loyola's Peoplesoft systems administrator, "the confidence to move forward with spring registration." A second Redline EIX 3250 was installed in front of the university's Peoplesoft 8 Web servers in March 2004, just weeks before the early April undergraduate registration for fall classes was to begin.

Fast Portal Access Regardless of Connection Speed

The Redline EIX 3250 brought several other key benefits. Previously Loyola's WebLogic servers had performed data compression, which had led to server errors in some users' Web browsers; once compression was offloaded onto the EIX 3250 (and turned off on the servers), those errors disappeared. Also, because of some graphics-heavy pages on the registration Web site, Slazyk had expected complaints about response time from those users with slow dial-up connections. But the anticipated gripes didn't materialize.

Additionally, bandwidth usage for the applications was reduced resulting in significant cost savings.

The Redline EIX 3250 has eliminated the need to purchase additional servers and provided a "safety net" for Loyola's Peoplesoft deployment," Sanders said. "Having fewer servers has saved us expensive software licensing fees. And the powerful load balancing capability has made server maintenance much easier. We can bring one server offline for maintenance, then put it back and take out another, with no interruption in service. And the EIX 3250 is easy to manage centrally through a Web interface.

Future plans call for the Redline units to be put to work accelerating two additional Web servers that host Loyola's main public-facing Web pages.

COMMUNITY SOURCE DEVELOPMENT, *continued from page 38*

gogical and technology ideas are exchanged, evaluated, argued, and the best emerge. We learn best practices from each other for how we work and how we think about our work. Carl Jacobson of the uPortal project comments that being a part of a community project is multidimensional; much of the value is in engaging on issues beyond the software itself. Many of us face the same set of policy issues on our campuses, e.g., regarding copyright protection and access polices for digital materials. The community source structure gives us opportunity to converse with colleagues at other institutions about policy and practices that the digital age requires.

Even as we become more individually engaged in community source efforts, we are obliged to consider the interest of our home institutions. At what point does the institution reap the benefit from our involvement? This will be realized when the institution is able to use the products of many community source projects together. What if the same content could be referenced or moved easily among a portfolio, a course management tool, and a scholarly archive? Imagine that your campus portal allowed each person to access data from all the tools they use in their learning, teaching, and research in a cohesive way.

The ultimate goal of community source efforts is to develop tools that meet the changing needs of dynamic teaching and research institutions. By working together, we can accomplish more than we could do on our own.

Lois Brooks (lbrooks@stanford.edu) is director of academic computing at Stanford University.

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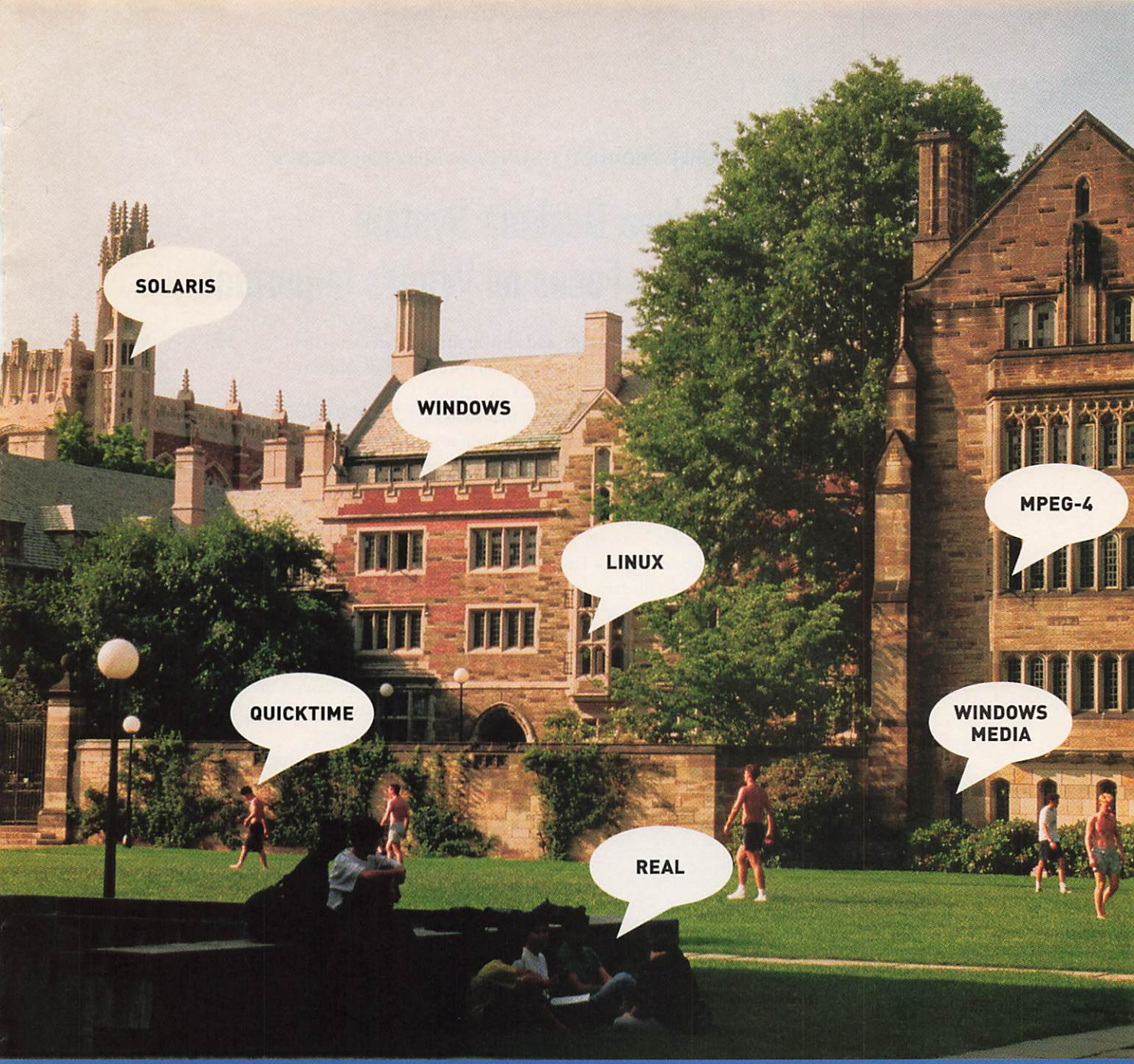

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FEATURED PRODUCT ■ SUN JAVA DESKTOP SYSTEM

Sun Java Desktop System Lets You Focus on What's Important

Every dollar schools and universities spend on expensive, proprietary software is a dollar less spent on education. So it is really no surprise that schools and universities worldwide have embraced open source software technologies—one of the most popular of which is Linux. The problem is that until recently, Linux was only available in server environments; even if education centers had a Linux server, they would still have to invest in proprietary platforms for desktop solutions. All this has changed, and schools and universities now have access to a full, open source computing environment.

Open source technologies are free, but often need to be compiled in a coherent fashion from a single source to provide product support. Sun Microsystems and others are leveraging these technologies in an attempt to offer an alternative to the expensive, insecure Microsoft Windows platform with products like the Java Desktop System, a Linux and Solaris-based desktop package based on open standards and leading open source components. The system includes the GNOME desktop environment, StarOffice productivity suite, Mozilla browser, Evolution mail and calendar client, and Java 2 Platform Standard Edition.

Sun Java Desktop

Cost Savings

As a complete package, the Java Desktop System offers educators substantial cost savings over Microsoft Windows and Microsoft Office. In fact, the Java Desktop System costs up to 80 percent less than a typical Microsoft Windows environment, with even greater cost savings through educational discounts. Furthermore, the Java Desktop System's low hardware requirements allow educational institutions to extend their investment in current hardware, saving money on new PC purchases.

Consider this: replacing 1,000 desktops at $1,000 each costs a staggering $1 million—a sum sure to cause cash-strapped school districts to take a second look at their priorities.

Security

But the benefits go far beyond budgeted costs. Computer Economics estimates that 2003 saw 7,064 new viruses, worms and Trojan horses, costing the private sector more than $13 billion. In the educational sector, potential losses go beyond the damage to costly school systems by threatening the integrity of the intellectual property stored there. Fortunately, Linux desktops like the Java Desktop System offer superior built-in security features that prevent viruses, worms and unauthorized users from modifying system files without root-level access.

Robust security is critical since educational institutions house priceless research, private academic records and other sensitive data on their desktop systems. More specific to the Java Desktop System, Sun's software provides additional security by supporting single sign-on technology through Java Cards and the Sun Java Iden-

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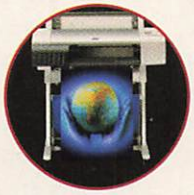

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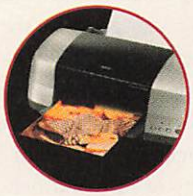

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tity Server, and by offering two-factor authentication and advanced identity management capabilities.

Usability and Familiarity

Many people fear that transitioning to a Linux desktop is too difficult—some early Linux desktop distributions could not even cut and paste text between applications. In contrast, today's Linux desktops are polished platforms containing tightly integrated applications that go beyond all the basic drag-and-drop, copy/paste and other functionality expected from desktop software.

Years of engineering work went into making the Java Desktop System look and behave similarly to Microsoft Windows so users find it easier to migrate. For example, both the Java Desktop System and Microsoft Windows have a "Documents" default folder and where Windows has a "Start" button the Java Desktop System has a similar "Launch" button. The StarOffice productivity suite included in the Java Desktop System helps cut complexity in migration even more by providing nearly flawless interoperability with Microsoft Office file formats.

Sun Microsystems went even further to drive complexity out of the equation for IT administrators as well by including the industry's first built-in desktop configuration management software for Linux desktops.

Change is Good

Educational institutions often lead change and the move to Linux is no exception. Sun is currently working with the People's Republic of China to bridge the digital divide by building a Linux desktop based on the Java Desktop System for deployment to 200 million users from educational institutions, the public sector to private users.

StarOffice and OpenOffice.org, key components of the Java Desktop System with over 40 million downloads worldwide, have seen unmitigated success among academic institutions having been formally adopted by schools in the Canadian state of Ontario, the state government of Haryana, India, and numerous other government institutions. Sun's Java Desktop System interface, solid security, and extensive features, is an ideal place to start.

To learn more about Sun's Java Desktop System, visit http://www.sun.com/javadesktopsystem

EVOLVING STRATEGIES, *continued from page 35*

Significant decisions regarding the development and adoption of a campus network strategy are usually made at the institution's cabinet level. Whether that is the Chancellor or President depends upon the size of the institution, but usually this cabinet includes a chief financial officer, a chief academic officer, and a chief administrator. All must be "on-board" for significant decisions involving expenditures to be made. If it is the case that the institution also views information technology to be as strategic an asset as buildings, administration, or financial holdings, then the CIO is well-placed to start the process of building consensus. But if the CIO is not at "the big table" then the key will be to find someone who is and who can articulate—passionately—the case for investment in campus network infrastructures.

What Does It All Mean?

There can be a tendency for institutional administration and its faculty and students to view all these "new" campus network needs as somehow the result of an overenthusiastic CIO/IT function. To make such an assessment is in error. Institutions are not isolated islands of research, teaching, and learning—they are a part of a world that has become connected, interdependent, and collaborative. Institutions no longer drive the use of information technology in the global sense; they are passengers on a train that has left the station. Institutions must react to the changes in the world that reflect the criticality of IT—and network systems in particular—and adapt, improvise, and overcome obstacles to their participation in the new global environment. These elements are critical factors in positioning the institution for success.

In the context of part of an overall strategy for information technology, the campus/institutional network (both the physical network and the staff that supports it) is a fundamental strategic asset for the institution. As such, it is vital that the institution keep control over its telecommunications infrastructure and most effectively manage it to maximize its contribution to achieving the institution's fundamental goals. By doing so, the institution can keep pace with the globalization of higher education that will undoubtedly continue through the rest of this decade, and further into the 21st century.

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CONTENT AREA 1: HIGH-TECH TOOLS FOR ADMINISTRATION

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Sessions are appropriate for administrative staff, managers, and department heads.

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Appropriate for IT directors and managers, CIOs and CTOs, and computer center directors.

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- DRM/intellectual property issues
- Globalization of education: policies and practices
- Evolving educational models

Appropriate for: chancellors, deans, presidents, vice presidents, provosts, CFOs, Chief Academic Officers, and institutional research directors.

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- Technology and student learning
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- Web-based content resources
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- Student technology assistants
- Interactive teaching modules
- Automating feedback to students

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Appropriate for instructional technology designers and implementers, curriculum developers, Web designers, and instructional media specialists.

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HOW TO SUBMIT A PROPOSAL – DEADLINE: NOVEMBER 30, 2004

Submit proposals via e-mail per the following instructions. Please be sure to include all of the information requested.

SESSION TYPES

Indicate the type of session for which your submission is best suited:

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POSTER SESSIONS	(1 HOUR)

I. The title of the presentation
II. The proposed session type (e.g., breakout session, panel session, etc. — see session types, above)
III. An abstract of the presentation content (600 words or less)
IV. An indication of the conference content area(s) into which your topic would most likely fall (see content area descriptions)
V. A brief session description suitable for publication (one 75-word paragraph)
VI. Name, academic title (e.g., Ph.D. or Ed.D.), e-mail address and phone number for each presenter (please include both home and office phone numbers, if applicable)
VII. Presenter(s) bio(s) suitable for publication (one 75-word paragraph each — be sure to include current position and affiliation)
VIII. Any further information that might be helpful in determining the relevance of your topic to the conference.

The final date for submissions is November 30, 2004. Notification of acceptance will be made by March 5, 2005. Proposals will only be accepted by e-mail.

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Due to the large number of submissions for our various conference properties, you will not receive a written confirmation of receipt. We encourage you to submit your proposal well before the due date of November 30, 2004. Accepted speakers will be notified by March 1, 2005.

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Campus Enterprise,

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developers, we handle extraordinary events very well.

The ordinary, in my mind, is a different problem. One of the challenges of running a great production environment—and our machine room is the heart of that environment—is having policies, standards, and procedures in place for routine, day-to-day operations. In our current environments, with hundreds of servers, managing an orderly production environment is a challenge. User pressure to reduce development and implementation costs, makes that challenge greater. Yet, a stable production environment is essential for our institutions. We test and turnover procedures for moving systems and applications to production. We need to insist on documentation for all systems moved to production. And we need to have standards for that documentation. With that work the next challenge is adoption of those policies, standards and procedures. At my university, we have done good work in development of standards and procedures. We have not been as successful at implementing the the standards and procedures. We need to make a real commitment to staff training in these new ways of doing our work. We need to hold our managers accountable for implementing the standards and procedures. Our staff need to understand that following these standards and procedures is part of their job. We need routinely review and modify our standards and procedures. Then we need to retrain.

With all the great stuff in our machine rooms, it's easy to think of them as a playpens. They are not. We should build test labs as playpens and test environments for our production systems. We need to give those who run our production environments the authority they need to ensure that our environments are safe and stable.

Annie Stunden *(stunden@wisc.edu) is chief information officer and director of the Division of Information Technology (DoIT) at the University of Wisconsin-Madison.*

Digital Tweed,

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electronic leash: we could "find" him at any time and he was always on-call.

But I'm not sure I want to be on-call 24/7, do you? Five years ago I seemed to manage fairly well without e-mail on my belt; 15 years ago I was able to make it through the day using pay phones, rather than walking down the street talking to myself. The people who called or sent e-mail had reasonable expectations about response time. In contrast, many people (including me!) now expect an almost immediate response to voice and e-mail messages.

Is this a familiar feeling? Are you, like me, feeling trapped between digital rocks and hard places? I want that new, multitasking phone. (Precious. *Precious!*) I want wireless for my notebook in airports, hotel lobbies, coffee shops, and public spaces. I want, indeed have come to expect, the compelling convenience of our increasingly wired/wireless world.

Concurrently, I've come to realize that I don't want anyone (let alone everyone!) to know that I am, in theory, accessible 24/7.

My July Saturday in San Francisco was an abrupt reminder that while I might enjoy a day on the dock of the bay, the box, like so many things over the last decade, has migrated from the physical to the digital.

Gimme shelter!?

An Endnote: In the Editor's Note that opens the magazine, Mary Grush reports that this will be the last issue of *Syllabus*. Come October, *Syllabus* will become *Campus Technology*. My name is on the long list of those who applaud Mary for providing editorial leadership for *Syllabus* for the past several years. I'm particularly appreciative that Mary provided a place for the musings of this Digital Tweed in *Syllabus*. Mary will serve as editor of *Campus Technology*, but she deserves special notice for her role at *Syllabus*.

Casey Green (cgreen@campuscomputing. net) *is founding director of The Campus Computing Project (www.campuscomputing.net).*

Reflections,

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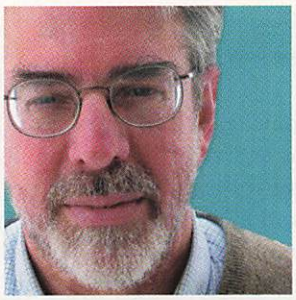
other electronic texts. It will also record spoken ideas and verbal annotation. It will include tools to help outline, organize, and summarize. For tasks such as learning vocabulary, it will have a tutor that will serve up electronic flash cards and remember where a student needs more help.

One can readily imagine many other basic tools, for example, simulations, academic portfolios, blogs, and self-assessments that would be integrated into this workstation; however, a great deal of its real power as a learning tool would be the use of the network for help and collaboration.

The network could be used to help learners by having peers and scholars who would be willing to answer questions. All learners and helpers would file a profile of their areas and levels of expertise. Some helpers would be volunteers who would be on the network at random times. Others would be paid, online, and available for specific hours. A helper on the network could decide how, when, and what topics to offer help. A student could pose a question that would be compared to the profiles of all helpers to find the best available person to handle the question. A dialogue would be established between the learner and the helper, and the result would be rated by the student and helper to improve the system. Other helpers could be brought in to collaborate if necessary.

With a collection of scholars and learners with profiles on the network, it would be routine to put together collaborative groups that spanned the traditional bounds of a university. Students and their newly discovered colleagues from around the globe could work together to learn about gravity, operating systems, the Renaissance or whatever—at any time, not just during the few hours that classes are held. Now that's a smarter way to learn.

Howard Strauss *(howard@princeton.edu), academic outreach at Princeton University.*



Howard Strauss

REFLECTIONS

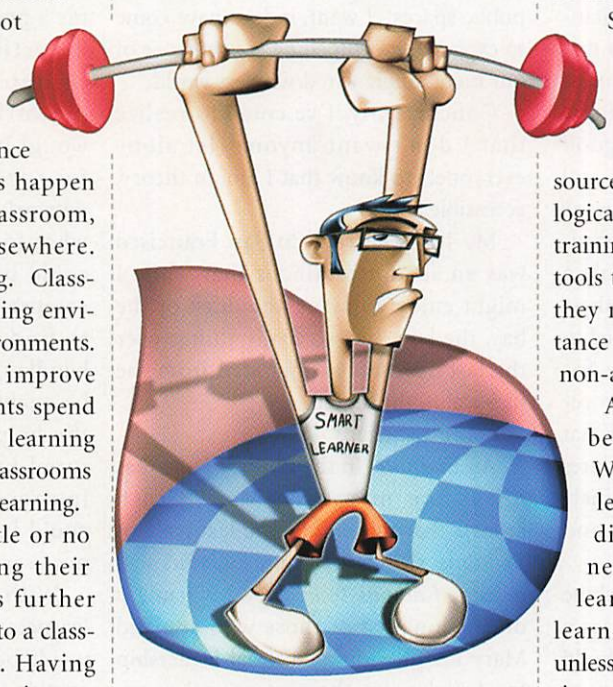
ANOTHER LOOK AT EDUCATION TECHNOLOGY

A Smart Learning Environment

The 2004 spring term at Princeton University included 12 weeks of actual class time. A typical university course met three hours per week. That allowed just 36 hours of class time to master AST 301 Gravitational Astronomy: COS 318 Operating Systems, or COM 314 The Renaissance. Thirty-six hours is not enough time for even the most scholarly students to develop gravitational, operating system, or Renaissance karma. While learning does happen within the confines of a classroom, most learning is done elsewhere. Students are always learning. Classrooms are much more teaching environments than learning environments. Better classrooms will help improve learning, but because students spend such a tiny amount of their learning time in class, even the best classrooms will have a limited impact on learning.

Many students spend little or no time in classrooms, getting their instruction remotely. This further constrains what can be done to a classroom to improve learning. Having comfortable seats, for example, is great for the students actually there, but adds nothing for students viewing the class from their bedrooms. Remote and local teaching may require different classrooms, but for all students, a classroom is just a tiny part of their learning environment.

For some time, the rest of a student's learning environment has consisted of textbooks and notes, the library, a professor's office hours, collaboration with peers, and pondering abstruse material until it is understood. These are still good ways to learn, but students need a smart mobile learning environment that can always be with them, not just the 15 hours per week a student taking five courses spends in class.



Before we give students a smart learning environment or smart classroom, we need to make them smart learners. We expend an enormous effort to teach athletes how to excel. We ensure that they know how to make their bodies ready for rowing, for example, and fuss about proper nutrition, exercise, and mental attitude. They do weight lifting, aerobics, and more. They aren't just told to row like mad any way they can and then we award them an A+ if they excel. That's what we do to our students in their academic pursuit, however.

We need to prepare students' brains to learn with the same care and thoroughness, which we prepare athletes' bodies to compete in sporting events. Students need to know how to take notes and use them, how to manage their time, how to do research in the library, on the Web, and with other sources, and how to write coherently, logically, and persuasively. They need training in the hardware and software tools that we expect them to use. And they need to understand the importance of rest, nutrition, exercise, and non-academic pursuits.

A smart learning environment can be used best by smart learners. While the infrastructure for a smart learning environment would be distributed, every smart learner needs to own an appropriate learner's workstation. Since a learner's workstation is not useful unless students have one, the workstation must be small, light, and wireless, run for a long time without being recharged (solar, fuel cell—who knows?), and support TV, radio, music, DVDs, games, and other forms of electronic entertainment that will bond the device to the student.

As a device often used on the go, it will need text-to-speech capability so that a student can listen to books, Web pages, calendars, notes, and

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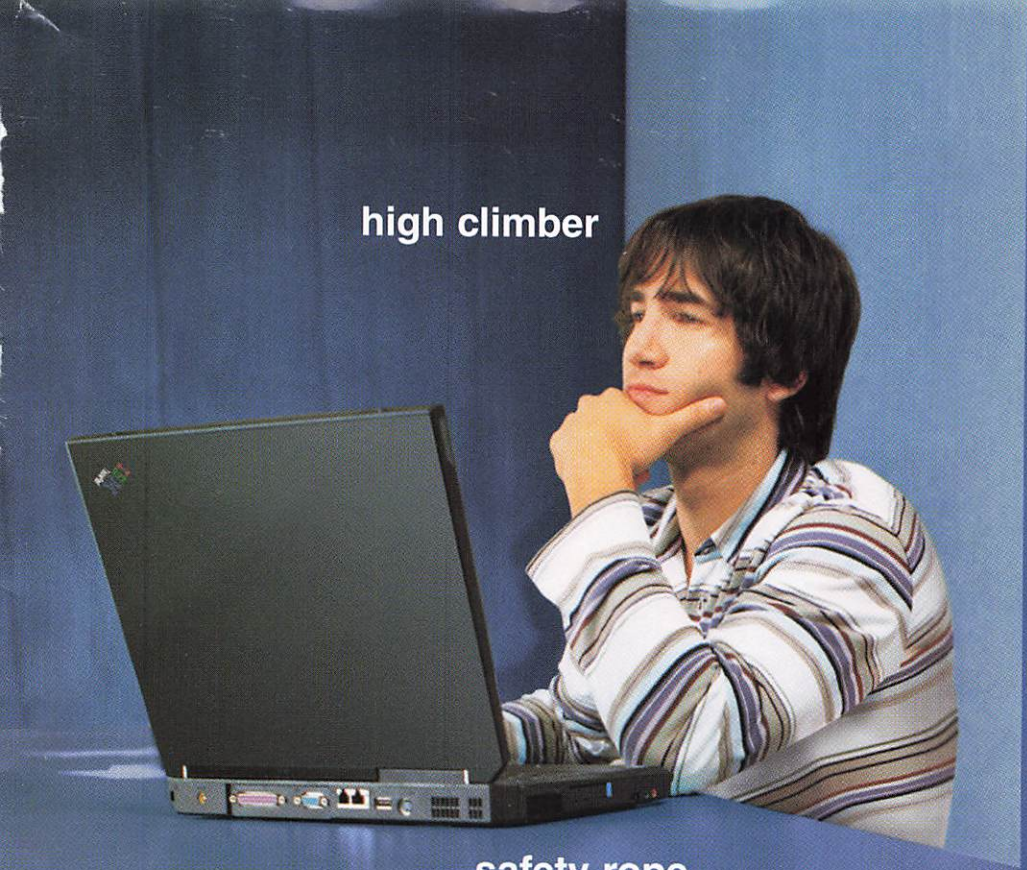
Illustrated by Peter Lacalamita



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